QUEENSLAND AGRICULTURAL JOURNAL

VOL. XI. MARCH, 1919. PART 3.

Agriculture.

COST OF COTTON-PICKING.

Why is it that would-be cotton-growers are often deterred from entering on this world-important industry owing to an impression that any profit which might accrue from its cultivation would be minimised by the cost of picking the crop by white labour. We have frequently pointed out the fallacy of this idea. On the subjects of growing and picking cotton, Mr. D. Jones, Instructor in Cotton Culture, Queensland Department of Agriculture, in a letter to a Brisbane newspaper last month, challenged the too-often repeated statement that the cotton industry needs cheap labour for its development. "Rather than this," he said, "the converse is true, particularly in countries where the white labour competes with black, as is the case in the American cotton belt. The Imperial Dominions Commission, when here, raised this issue. A direct challenge to prove it moved them to get a Consular report on the question, bearing out my statement that the white man could raise cotton better and cheaper than can the coloured folk.

"Beyond this is the fact that labour for many years past has been on the whole in America better paid than on Australian farms, even allowing in instances the high rural log awards of our Southern States. Mexican greasers in the new cotton belt of the Imperial Valley in California are said to be paid 1s. an hour for their work. It is a usual thing for farm labour in the States to be paid from 4 to 5 dollars a day. The American negro is a hustler at picking cotton and can and does earn from 10s. to 12s. a day in the field. How many get this remuneration in Queensland, be they employers or employees? It is quite possible for any active juvenile to gather 100 lb. of fibre per day, which costs rather under 5s. than over to raise. This cotton at 3d. per lb. (1d. less than paid last season) is worth 25s., hence a worker, if on his own crop, is richer by 20s. for his day's toil. Assuming he had to pay ¾d. per lb. for someone else to gather it, he then would be in pocket, and the juvenile worker the better off by 6s. 4d.; if his ability to gather 200 lb. a day were demonstrated, an easy task for an expert picker, his earnings would be 12s. 8d. per day."

[The "Monthly Crop Report," Washington, U.S.A., quotes the following prices per 100 lb. for picking cotton by white labour at the opening of the last season in the cotton-growing States:—

"North Carolina, 4s. 11d.; South Carolina, 4s. 1½d.; Georgia, 4s. 2d.; Florida, 5s. 7d.; Alabama, 3s. 10d.; Mississippi, 4s.; Louisiana, 4s. 2d.; Texas, 5s. 2d.; Arkansas, 5s. 4d.; Tennessee, 5s. 5d.; Oklahoma, 6s.; California, 8s. 4d. Roughly, the cost in the above States per lb. would amount to about 3½ farthings (less than 1d.). The cost of picking in Queensland's palmy days of cotton-growing was ½d. per lb. (white labour), at which price young people were able to earn from 3s. 4d. to 5s. per day, whilst expert two-hand pickers made 8s. 4d. per day, starting at 9 a.m., the late start being necessary to allow the cotton to be dry after the night dew."]

SUBSOIL BLASTING.

Since the war explosives have been expensive and they have been hard to secure. In consequence, there has been a falling away in the interest which was being taken in the subject of farming with explosives. In the early days many claims were made for explosives which had to be taken for granted. The effect of subsoiling could only be surmised. There seemed little doubt that to stir up the subsoil must make a great difference in the yield of deep-rooting crops. But there were few proofs taken over an extended period. We were interested, therefore, in some figures in the *Scientific American* bearing on some extended experiments.

Back among the hills of Georgia an interesting experiment in subsoil blasting has been in progress for the past four years. The soil in this district is of a rich upland grade, and the subsoil is red and hard, with emphasis on the hard. In 1914 2 acres were measured off. One was left for a check acre, the other was subsoiled with dynamite. Charges were exploded with blasting cap and fuse every 15 feet, 30 inches deep. This thoroughly shattered the hard, red clay, making cobweb fissures in all directions and thus permitting more water to enter than had before been possible. The roots also benefited by the breaking up of the subsoil, new avenues being opened up for them to go out in search of plant food.

Both acres were planted to cotton in 1914. Both received the same cultivation and care, though the sub-soiled one got a little more fertiliser than the other. The difference in this respect was not nearly enough, however, to account for the discrepancy between the yield of 1,804 lb. of seed cotton for the blasted acre and 912 lb. for the unblasted plot.

Corn followed in 1915. This year both plots received identical treatment and fertilisation. They were both kept well worked and clean. The yield of corn in the husk was 2,614 lb. for the blasted acre, and 1,894 lb. for the other. Owing to the wet weather, it was impossible to weigh the fodder; there were, however, 225 bundles on the blasted acre against 115 bundles on the check area.

In 1916 the plots were in cotton again, and the benefits of the blasting were more pronounced than ever. From the very start of the growing season, the cotton on the subsoil acre outgrew the other, and by midsummer it was at least twice as high. It also fruited much better than that on the unblasted land, and when the yield was measured it was found to have been exactly twice as productive—2,000 lb. against 1,000 lb.

In 1917 corn was once more planted on the two test acres. The blasted acre yielded 42½ bushels of corn and three full loads of fodder; the unblasted acre, 35 bushels and scant two and a-half loads of fodder. The conclusion was therefore forced that the blasting had been a profitable investment. The increased yields soon took up the initial cost, leaving all subsequent crop increases as net profit. This is good farming as well as good business.—"Farm Bulletin."

WHEAT-GROWING NOTES.

By R. E. SOUTTER, Manager, State Farm, Bungeworgorai.

During recent years the wheat farmer has met with a good deal of disappointment and loss, so much so that many have decided to discontinue with this crop and take up others, or go in for stock.

It is not by any means intended in the following to offer suggestions for the better cultivation of the heavy lands of the Darling Downs, where most of the wheat of the State is raised, but to make a plain statement of facts which contributed to the success of a crop of Warren wheat at the Roma State Farm, in a season when, with few exceptions, the whole of the winter crops in the State may be said to have failed, owing to the exceptionally dry season.

To prevent losses to such a degree under these conditions in the future much more attention must be paid to the principles of "moisture conservation" in the soil than is now given by the farming community. Any rainfall chart of Queensland demonstrates how necessary this is, showing as it does that the greatest precipitation occurs during the summer months, when the evaporation is greatest. It follows, therefore, that all cultural operations, more especially in the drier parts of the State, must be carried out with the object of trapping and conserving the moisture, as experienced, for the prospective crops, and until such is carried out systematically and consistently, failures will be more often recorded than successes. Experiments to determine the most suitable methods to adopt, in order to conserve the maximum amount of any given rainfall, emphasise the fact that no hard-and-fast rule can be laid down, as the condition of the soil, and kind, amount of precipitation, and the

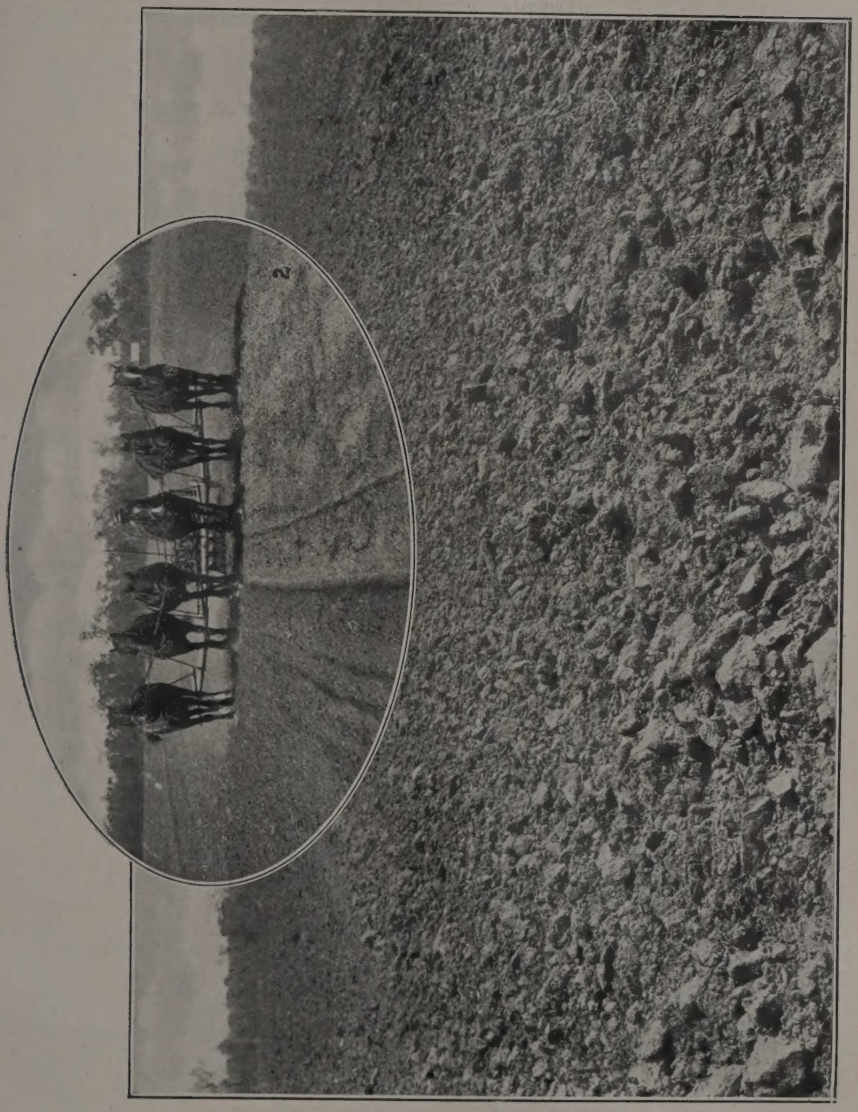

PLATE 5.—ROMA STATE FARM—WORKING THE FALLOWS WITH THE "ONE WAY" DISC CULTIVATOR.

manner experienced, and the time of the year necessitate different treatment, which can only be decided by the individual who is aware of the peculiarities he has to contend with; and armed with the knowledge of how to overcome them, such person must be governed by actualities and not probabilities.

The crop of Warren wheat, from which a return of approximately 24 bushels to the acre was obtained, was grown in a field of 27 acres of alluvial soil (box flat), cropped in 1916 with wheat for hay, which was cut in October. No cultural operations of any kind were carried out until November, 1917, when the field was ploughed. By that time it was in a weedy condition, and in order to make a good job of the ploughing, the vegetation was rolled down ahead of the plough, which was turning it over to a depth of between 6 and 7 inches. In January, the paddock was again ploughed; during February, owing to the presence of weeds, it was deemed advisable to cultivate it with the one-way cultivator; another skim-ploughing was given it in March; and in April the paddock was cultivated and harrowed. These operations

were necessary in order to destroy the weeds and prevent the formation of a crust on the surface, both of which quickly reduce the moisture content of the soil by transpiration, evaporation, and retarded percolation.

Seed, which was treated with copper carbonate as a smut preventive, was sown during the first week in May and germinated about the third week. The crop was harvested in the third week of October, and, as already stated, yielded approximately 24 bushels to the acre.

It is acknowledged that the working is much in excess of that usually given to the wheatfields, but all operations were absolutely necessary in order to receive the maximum benefit from each, and not only was a fairly good yield obtained, but a paying one as well, as the undermentioned figures illustrate. These latter are based on the following rates:—Man, 10s. per day; horses, 2s. 6d.; the rate for horses must be reckoned to be fairly high, as very few farmers feed their horses to anything approaching this figure:—

At per acre.	£	s.	d.
Three ploughings at 7s. 6d.	1	2	6
Two harrowings at 1s.	0	2	0
Two cultivations at 3s.	0	6	0
Drilling at 2s.	0	2	0
Seed, ½ bushel per acre at 6s.	0	3	0
¾ cwt. superphosphate at 7s.	0	5	3
Pickling, per bushel, 3d.	0	0	3
Harvesting (stripper) 4s.	0	4	0
Bags at 12s. per dozen	0	8	0
Growing and harvesting	2	13	0
Value of crop at 6s. per bushel	7	4	0
Balance (net return per acre)	£4	11	0

By removing crop with a harvester, the cost of production would be reduced by about 1s. per acre.

FODDER CROPS FOR IMMEDIATE PLANTING.

Mr. H. C. Quodling, Director of Agriculture (writing last month), in view of the many inquiries reaching the Department concerning fodder crops for immediate planting in coastal districts, advises:—

"The future of the maize crop, on which poultry, pigs, and other farm stock depend, calls for a quick-growing grain crop of high feeding value. It is, of course, not too late yet to take the risk of planting rapid-maturing kinds of maize, like Improved Ninety Day.

"Another crop which deserves attention in sheltered situations or where frosts do not generally appear early, is green sorghum. From a nutritive standpoint for stock-feeding purposes, the grain stands about midway between wheat and maize, and yields of fully 60 bushels to the acre are quite common; in fact, the departmental experimental tests made in several districts have been much higher on the average, 103 bushels per acre being secured in one instance under exceptionally favourable circumstances. Several kinds of grain sorghums are grown in Queensland, which originate from seed imported by the Department some years ago through the Bureau of Plant Industry in Washington, U.S.A. For late planting, the dwarf varieties are to be preferred, as they mature in from 3 to 3½ months, but should be grown in drills spaced wide enough apart to admit of inter-row cultivation, in preference to broadcasting.

"Dealing with the subject of fodder crops, Mr. Quodling states if the rainy season makes good there is still time before the winter sets in to raise a variety of summer fodder and ensilage crops, such as Liberty millet (giant panicum), Japanese, Manchurian, and French millet, and Soudan grass, all of which will mature in about eight weeks' time. These crops also make a rough class of hay calculated to provide bulky food for the winter.

"Of the stronger-growing and heavier-yielding fodder crops, maize and different kinds of sorghums may be sown. Planter's Friend, if sown broadcast in February, makes an excellent crop for cutting in the early part of the winter, and the advantage of selecting this variety is that it will not become too pithy to use even after a few light frosts.

"For winter crops, for soiling or grazing off, it is possible under ordinary seasonal conditions to commence by making sowings in late February of Sea of Azov, Cape or skinless barleys, with successive sowings monthly, up to the first week in July. Wheat, oats, rye, and canary seed will afford a variety of green feed, but the sowing season should be a little later, the first sowing being made in late March or early April, for everything but the oats, which can be held over until May and June.

"Owing to susceptibility to rust, certain kinds of wheat and oats are to be preferred. Macaroni wheats, like Le Huguenot and Bald Medeah, are good coastal varieties for green feed. Of the bread varieties, Florence, Thew, and other quick-growing kinds, are likely to give the most satisfaction. Ruakura rust-resisting, Algerian and Sunrise oats are in favour for both green feed and hay.

"It is not as generally recognised as it should be that field peas and vetches make excellent additions to all winter growing cereals; grown together and mixed in this way the palatability and nutritive qualities of the fodder are increased and heavier milk flows will be accordingly maintaned by dairy cows. Dwarf Essex rape, mangolds, Swede, and other field turnips, sugar beet, and thousand-headed Kale are crops which deserve consideration where mixed farming is being carried on. The first sowing of Swedes and rape for a catch crop can be made in February, and the main sowing of the several crops named in March and April.

"Suitable farm-grown foods for pigs are likely to be very scarce this year, and the latter classes of crops will work in soon after Amber cane and grain sorghums (two useful crops for pig feeding) reach their seasonal development in the autumn."

IRRIGATION.

ECONOMIC AND PRACTICAL METHODS—No. 3.

By P. MAHONEY.

Different Systems of Irrigating.

There are several different ways of irrigating or watering land, the most universal and successful being the furrow system. The flooding of land has in some cases been resorted to, such as in lucerne growing or in the case of any fodders which are not grown in rows. The spray system is not too highly favoured, except under certain circumstances, such as the watering of fodders which are broadcasted. The flooding system has many advantages over the former, and is less expensive. The spray system has also one great disadvantage in watering fruit trees or vines, &c., which is hereafter explained.

The Furrow System.

The means of irrigating with the aid of furrows have proved to be the most effective, least expensive, and most satisfactory, for it is possible to irrigate speedily on account of the large body of water that can be handled. Of course, that is where thorough cultivation is practised, for the better the ground is cultivated the quicker it takes in the water. Where irrigation is indulged in to any great extent in growing fruit trees or vines, &c., the furrows can be made for equal watering a little further away from the plant, thus encouraging the roots to spread, much to the benefit of the plant. But as the plant grows older, the demand for moisture is greater; therefore, to supply sufficient water with the minimum of expense and labour, it will be necessary to irrigate with two, or perhaps three, furrows on each side of the plant—that is, where the plants are 10 ft. or more apart. To give the ground a good soaking when the plants are 25 ft. or more apart, it would be necessary to make as many furrows as the nature of the ground warrants. If there is a clayey or heavy subsoil, the furrows can afford to be further apart than when it is of a sandy nature, for when the water strikes the heavy subsoil, this being harder to penetrate than the lighter soils, it has a tendency to spread along on top of it as well as soak into it; then the capillary attraction brings it to the surface. Thus, under these circumstances, it is easier to give the ground a thorough soaking. If such land happens to have only a slight fall, furrows from 2 ft. to 2½ ft. apart would suffice for a thorough watering. The greater the fall the land has, the closer the furrows should be. Once a heavy subsoil, such as described, gets a good soaking, it will retain its moisture for a wonderful length of time, providing the surface soil is well cultivated.

When the subsoil is of a heavy or clayey nature, great care should be exercised in watering, for it is under these conditions that seepage and bad drainage often occur.

In the event of the subsoil being of a sandy nature, it will then be necessary to have the furrows closer than when of a heavy nature, for then the water takes longer to soak sideways, as it has nothing to check its downward course. The closeness of the furrows also depends largely upon the fall in the land.

In watering land between the rows of plants with the aid of five or six furrows, it is not advisable to run the water down each furrow until it has had sufficient, for to do so would in all probability cause a surplus at the bottom of the furrow or on the headland, which would be of no benefit.

To avoid any waste of water, and to irrigate effectually and quickly, it is necessary to keep turning the water from furrow to furrow, allowing it to run only for a short time after it has reached the bottom before turning it into another furrow, thus avoiding any surplus water at the end of the rows. It is generally advisable to run the water in the same furrow twice, or even three times, until the ground has had enough. In all probability three and even up to six streams can be running down the furrows at once.

In furrowing out land similar to that just described, it would be necessary to have a two-horse cultivator, for with this implement it is possible to make as many as four furrows at once by attaching bursters to it.

In the event of it being difficult to avoid the accumulation of surplus water at the bottom of the rows, effective means should be resorted to for carrying it away. It should be caught in a drain and conveyed to a dam, or turned on to pasture land.

In the case of irrigating sugar-cane, which is grown in rows three or more feet apart, I presume that it would be difficult to irrigate the plants after they had attained the height of 4 or 5 ft. and over, for naturally it would have leaves spreading well across the space between the rows, and their knife-like edge would make the furrowing out and cultivating difficult or even prevent it. This, I daresay, could be overcome by giving the land a thorough watering at the last favourable opportunity, following with a thorough vigorous cultivation, which would, I daresay, bring it into maturity.

Its irrigation could in all probability be made more practicable by planting the rows further apart than usual, thus allowing for all necessary preparations and cultivation, thus making it necessary to have two furrows for watering between the rows.

Maize, vegetables, and such like, which are planted closer, would only need two furrows when the plants are young, or where the land has a fall to any extent.

The flooding of land should only be resorted to when there are no other means of watering same, such as the watering of broadcast crops. But when this is carried on, the land should be sectioned off by check banks, and each section flooded separately, thus avoiding any surplus water. The watering of land in this manner should be done on a dull day or in the evening. Great care should be taken, for the quality of crops so irrigated can be spoilt and made valueless through over watering.

The spray system of irrigation can also be used for the growing of fodders, but it is a slow process compared with flooding, and the installation and upkeep are much greater. It is inadvisable to use this system for the irrigation of fruit trees, vines, &c., for when the spray is allowed to reach the foliage and wet it, if hot and muggy weather is prevailing, it will have a tendency to breed fungus diseases, as the warm, moist, sheltered position, such as the foliage would afford, would be an ideal place for the breeding of same. It certainly is not to be compared with the furrow system in regard to the watering of large acreages.

(To be Continued.)

COTTON-GROWING IN PAPUA.

The "Papuan Courier" of 13th December, 1918, writes as follows on the subject of cotton-growing in the Possession. We have ourselves seen excellent cotton growing in some districts outside Port Moresby, on rubber plantations, and the yield and quality of the fibre left nothing to be desired. It would naturally be supposed that in that land of cheap labour, cotton-growing would prove as great a success as in Queensland in times past, but it would appear that of late years labour troubles have arisen to the detriment of the industry.

The article in the Papuan journal alluded to reads:—

"An industry that might well occupy the attention of Papuan planters is the growing of cotton. Such a vast amount of cotton was absorbed on the fields of Europe that there will be a shortage of supplies for some time to come. During the

period of the war a 12-inch gun disposed of half a bale of cotton with every shot fired. A machine gun in operation used up a bale (roughly 4 cwt.) in three minutes. In a naval battle, like the one off Jutland, from five to six thousand pounds a minute were consumed by each active warship. It took more than 20,000 bales a year to provide absorbent cotton to staunch and bind the wounds of the injured. One change of apparel for all the troops engaged in the war represented more than a million bales. One hundred thousand bales were required to equip the aeroplane fleet if cotton, as was found necessary, supplied linen for wings. The U.S.A. turned nearly a million bales a year into explosives alone. On top of this great consumption of cotton for war purposes, the United States cotton lands were infested by an insect pest, known as the boll weevil, which materially interfered with the quantity of the output.

"Middling American cotton, which in 1915 was quoted in the Liverpool market at 5.08d. per lb., was selling this year at 22.27d. per lb.

"The B.N.G.D. Co. some years ago attempted cotton-growing, and produced a first-class article. They installed a ginnery, but owing to native labour troubles they were compelled to cease operations. The quality produced was considered by English experts to be equal to the best, and it was with great reluctance the company dropped the industry.

"The Department of Agriculture in Queensland, recognising the vast possibilities attaching to the growing of cotton, offers to receive from growers raw cotton, and to gin and market it on the owners' account. An advance of 2d. per lb. for the year 1919 will be made upon the raw cotton received, and any surplus after sale, after deducting charges, will be paid to the grower pro rata. The Department will also supply growers with cotton seed free of cost, and railage paid, allowing 10 lb. of seed per acre, to provide for replants or any other contingencies.

"If Queensland can make a paying proposition of the industry, surely it is up to Papua to do likewise. With the large amount of native labour at its disposal there seems to be no reason why cotton-growing should not be established here on a large scale. At present one of the great drawbacks is the enactment that native women and children may not take part in plantation work. Women and children are eminently fitted for the picking of cotton, as their hands are more supple, and if the males were accompanied by their wives and children, the whole family bringing grist to the domestic mill, it would not only enable them to greatly improve their position financially, but would make their native happier and more contented.

"The work of cotton picking is done by women and children in the chief cotton-growing countries, which are United States of America, India, Egypt, Brazil, Peru, and Central Asia, with satisfaction both to themselves and the planter. About 40,000 lb. of seed cotton were delivered, ginned, and marketed on farmers' account during 1918 in Queensland. As the experimental efforts of the B.N.G.D. Company point to the suitability of Papua for making cotton a staple crop, we hope to see governmental support and assistance given in this direction."

[The figures quoted concerning the Queensland crop of 1918 are not quite correct. The quantity of raw cotton grown by farmers and delivered to the Departmental ginnery totalled 166,458 lb. which yielded 54,280 lb. of lint, besides 2,643 lb. of linters—that is, the short fibre which is detached from the seeds after the first ginning, which was marketed at 1s. 1d. per lb. The farmers received an advance of 2d. per lb., and when all expenses were paid, they got a further 2d. per lb., which paid them well, notwithstanding the cost of picking.—Ed. "*Q.A.J.*"]

THE SUGAR INDUSTRY.

In this month's journal we publish the first of a series of articles on the cultivation of sugar-cane in Queensland, by Mr. H. T. Easterby, General Superintendent of Sugar Experiment Stations. These will, later on, be published in Bulletin form, and should prove of great assistance to returned soldiers and others who have either already selected sugar lands in various sugar districts in this State, or who propose to enter upon the business of cane production in the near future. In the early days of this industry, suitable lands were easily obtained on navigable rivers, scrub lands, on the coast, and open plain lands, lightly timbered, were chosen in preference to the less rich hill country or to the western plains unsuitable climatically for tropical agriculture. The taking up of land, the cost of cultivation, and subsequent operations incidental to the industry will all be dealt with in the course of this series of papers, based on long experience and careful experiment in field and laboratory.

Pastoral.

OSTEO-MALACIA.

By A. MACKENZIE, Government Veterinary Surgeon.

This disease, which affects adult cattle, occurs in several parts of the State. It is due to feeding over lengthy periods on foods which contain insufficient lime to satisfy the bodily requirements.

Cattle, particularly heavy milkers, or those suckling calves, are most commonly affected; sheep, goats, and pigs occasionally, and rarely horses. In all animals the symptoms are similar.

Mineral salts are present in all animal bodies, and are essential for the development of the bones and for the proper performance of the functions of secretion and excretion. In adult bones, about 66 per cent. of the weight is composed of mineral salts, chiefly lime. To maintain the body in health, and ensure its perfect development, mineral salts are equally as essential as are proteids and fats.

Most soils contain a sufficiency of lime, which, in a soluble form, is drawn up by the grasses and plants and stored in the tissues. From this source, herbivorous animals procure the requisite supplies. In some soils the proportion of soluble lime is exceedingly low, and quite insufficient for animal requirements. But as it is essential that for the performance of its functional duties lime be present in the blood, to supply the immediate need, absorption from the bones occurs. Should this condition continue over a lengthy period, serious constitutional changes occur. As the presence of lime salts in the bones makes them stronger and better fitted to support the body weight, the gradual absorption would be attended by interference with locomotion. Though the animal may appear in fair condition, its movements are typical of the condition. With back arched, it moves in a stiff, constrained manner, as if uncertain and afraid, with a slightly rolling movement. As time goes on, these symptoms increase in severity, until eventually it cannot retain an upright posture. At no stage are there any noticeable symptoms of sickness.

Post-mortem examination reveals the bones soft and shell-like, with the interior honeycombed and filled with reddish marrow. The periosteum (fibrous covering of the bone) is easily detached. The bones are light, and easily broken. It is not unusual to find several of the ribs showing signs of recent fracture, probably from pressure in lying down. Treatment consists of supplying artificially the deficiency in lime salts. In small holdings top dressing the pastures with lime acts satisfactorily. But in large holdings, and where dressing the soil is not practicable, recourse is had to specially prepared "licks." A good mixture is composed of sulphate of lime (gypsum) and powdered sulphate of iron, of each one part; coarse salt, 4 parts; fine bone meal, 8 parts. A liberal supply should be placed in covered troughs in close proximity to the water supply.

VALUE OF THE SILO.

TEN YEAR-OLD SILAGE.

For a long time the Department of Agriculture and Stock has by precept and example, as well as by assistance of experts in the building and filling of silos, done all that is possible to induce owners of stock to preserve fodder, so plentiful in good seasons, against such a season as is now being experienced, when the growth of fodder plants is at its lowest ebb, and stockowners, especially dairy farmers, are at their wits' end to keep their cattle alive. There are, unfortunately, many who still neglect to make this simple provision for their stock.

As an example of the importance of the silo, we quote, from the Brisbane "Grazing Farmer," the following experience of Captain F. G. Waley, a breeder of stud cattle at Mowbray Park, Picton, N.S.W.:—

"I am thoroughly satisfied," he says, "that the experiment is a highly payable one, and the freedom from anxiety which it ensures cannot be over-estimated."

"That was the opinion expressed by Capt. F. G. Waley (N.S.W.) in 1907, after his first year's experience of conserving fodder in silos for his stud cattle at Mowbray Park, Picton. He had erected a nest of four tub silos, of a total capacity of 540 tons, and filled them with chaffed maize. Despite some delays, which tended to depreciate the quality of the silage, it proved a great stand-by in the dry season, which happened along in his first year.

"Those four silos were filled again in April, 1909—nearly 10 years ago—and the last of the reserve then put by is now being drawn upon. A sample of the silage—made from green maize cut in the milky-stage of the cob—now being used shows the fermentation to have been perfect, and the rich aroma is like that of brewer's malted grains. Another point is that portion of the contents of the silo now being emptied was used in the drought of three years ago, leaving 60 or 70 tons in the bottom. This at the time was topped off again with wet straw and properly weighted. The quality of this left-over portion has in no way deteriorated; in fact, like wine, it appears to have improved with age. The keeping quality was certainly improved, for it will keep for a couple of days after removal from the silo without heating.

"Now that the district is very dry and there is little natural feed, Captain Waley is drawing upon this 10-year-old reserve of succulent fodder. His milking cows are receiving a daily ration of 40 lb. of silage, with a little lucerne chaff and a handful of bran. On this the cows, he says, are milking even better than if on good grass. The silage is carted out and distributed in the paddock to the young stock, which simply rush it and lick up every particle.

"An experience of this sort is a telling object-lesson, especially to dairy farmers. As Captain Waley puts it, 'it shows what one can do by taking advantage of the good years to store up a reserve of fodder, which, while it costs nothing to keep, even improves year after year, and is invaluable when a drought comes along, like the present.' "

The Orchard.

THE CASSABA MELON.

Mr. H. A. Adams, Yalleroi, writes in praise of the Cassaba melon, which we described and illustrated in this journal in April, 1917. The seed was brought to Brisbane by Mr. W. H. Mobsby, of the Agricultural Department, from San Francisco, and he was successful in raising several plants which fruited, and he distributed seed to applicants in several districts in this State. The fruit ripens in the United States in July, and continues bearing and ripening all the summer and autumn until the frosts come. Mr. Adams says that he planted the seeds sent to him under the name of either White Africa, Golden Hybrid, or Santa Claus. About the middle of October they began to grow rapidly. The growth was so wonderful that he eased off the water—in fact, the plants had no water afterwards except by soakage. The first melons were cut in December, on Christmas Day. The largest turned the scale at 22½ lb., and the lightest weighed 10¼ lb. After numbers of fruits had been cut off the vines, they bore a second crop.

"Other rock melons," says Mr. Adams, "are not in it with the Cassaba. The flavour of the latter is superb." Mr. Adams will be pleased to send to any readers of the journal interested in fruitgrowing a few seeds if they write to him and send stamped envelope for reply.

One noticeable feature about these melons is that the ladybird will not attack them as they do other classes of rock melons. The seed was obtained from Mr. B. Harrison, Burringba, New South Wales, and Mr. Adams also received some from Mr. Mobsby.

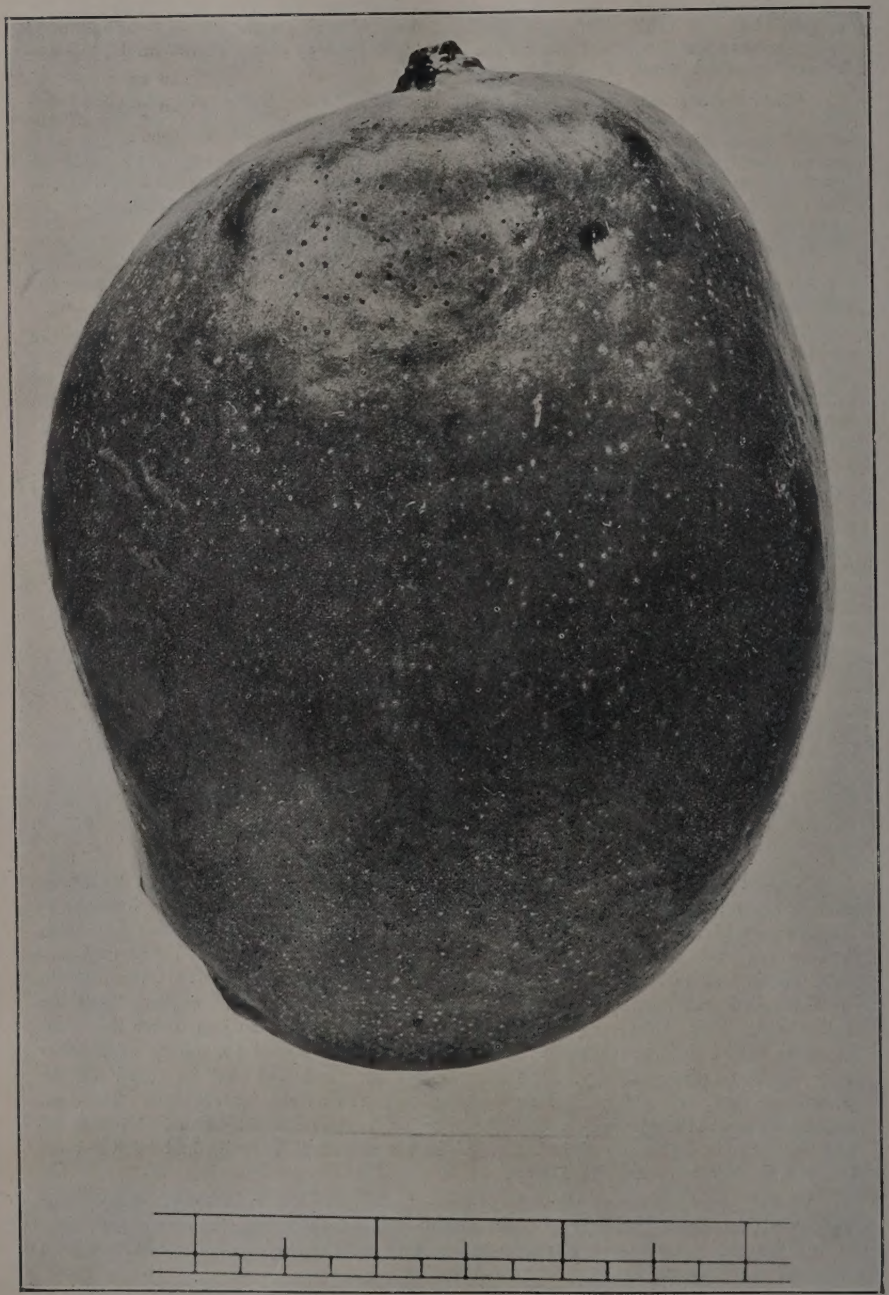

PLATE 6.—MANGO (LANGRA TYPE).

MANGO (LANGRA TYPE).

We here give an illustration of a mango grown by Mr. W. Pacey, Indooroopilly. The average weight of the mangoes is said to be about 2 lb. Not having seen the fruit, except as it came from the tree, we cannot give any opinion on its flavour, freedom from fibre, &c. The tree producing these fruits is eighteen years old, and this year has borne about ten dozen of the size figured. The seed is also here illustrated.

Plate 7.—Seed of Mango (Langra Type).

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1919.

The competition has now reached an interesting stage. In the heavy section there is a great fight for the premier position between the Nobby Poultry Farm and D. Fulton's pens. Nobby Poultry Farm's D bird, which had not laid since 5th November until she commenced on 29th January, should help her owner's chance if she sticks to her work. The birds of both the above owners look well, with the exception that Fulton's C bird shows signs of an early inclination to broodiness. The positions in the heavy section have every appearance of being altered considerably next month, as the pens scoring best for January are having birds removed for broodiness, whilst those giving a poor account of themselves for the month have freshened up after broodiness, and look fit for a good month during February. In the light section the laying has been very uneven. About the middle of the month the output of the Dixie Egg Plant's pen dropped considerably, three birds ceasing for several days. The pen, however, rallied splendidly, laying 35 eggs in the last seven days. That a competitor does not always select his best birds to represent him in the competition is very apparent in some cases, and the drones competing must be very annoying to the owners. Range Poultry Farm's A bird, which replaced one that was destroyed for dropsy on 12th October, has 81 eggs to her credit for 112 days of very trying weather. If only this bird had been selected in place of the original A bird, the owner's position would, no doubt, have been bettered. Quite a number of pens show drones at the present time, and some comment on this subject will appear in the final report. Several birds are now moulting, several of which are still adding slowly to their score. All the pens are now on the new site. Those removed have had a check, but have taken it much better than we anticipated. Quinn's Post Poultry Farm's B bird died from apoplexy during the month, and several other birds have been treated for troubles caused by the excessively hot weather and the drought conditions. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS.			
*Dixie Egg Plant	White Leghorns ...	116	1,373
*G. W. Hindes	Do.	118	1,297
*E. Chester	Do.	104	1,277
*Tom Fanning	Do.	122	1,240
*W. Becker	Do.	109	1,213
*C. P. Buchanan	Do.	93	1,198
*Mrs. L. Henderson	Do.	118	1,191
*Geo. Prince	Do.	96	1,189
*G. H. Turner	Do.	91	1,184
*W. Lyell	Do.	105	1,175
*G. Howard	Do.	83	1,164
*E. A. Smith	Do.	105	1,151

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS—*continued.*			
*L. G. Innes	White Leghorns	102	1,136
*Dr. E. C. Jennings	Do.	119	1,134
*Oakland Poultry Farm	Do.	100	1,133
*C. Knoblauch	Do.	97	1,121
*R. Holmes	Do.	89	1,117
*Quinn's Post Poultry Farm	Do.	104	1,093
*Range Poultry Farm	Do.	112	1,091
*O.K. Poultry Yards	Do.	84	1,082
*Thos. Taylor	Do.	104	1,081
B. Caswell	Do.	80	1,079
J. J. Davies	Do.	101	1,077
*Mrs. A. T. Coomber	Do.	111	1,055
*J. M. Manson	Do.	132	1,052
*Homalayan Poultry Farm	Do.	107	1,032
H. Fraser	Do.	74	1,028
Mrs. L. F. Anderson	Do.	127	1,022
*Mrs. R. Hunter	Do.	114	1,001
Mrs. A. G. Kurth	Do.	107	988
*J. Zahl	Do.	86	981
Geo. Trapp	Do.	122	962
O. W. J. Whitman	Do.	87	961
*C. Porter	Do.	75	953
H. B. Stephens	Do.	110	939
*T. B. Hawkins	Do.	91	938
Shaw and Stevenson	Black Leghorns	88	917
*J. W. Newton	White Leghorns	76	907
S. Wilkinson	Do.	72	904
Progressive Poultry Pens	Do.	87	901
H. F. Britten	Do.	84	890
B. Chester	Do.	91	890
P. O. Oldham	Do.	93	880
G. Williams	Do.	67	879
R. T. G. Carey	Do.	83	877
W. A. Wilson	Do.	89	841
A. W. Walker	Do.	76	806
HEAVY BREEDS.			
*Nobby Poultry Farm	Black Orpingtons	96	1,216
*D. Fulton	Do.	134	1,158
*R. Burns	Do.	111	1,102
*E. F. Dennis	Do.	118	1,072
*E. Morris	Do.	82	1,070
*A. E. Walters	Do.	69	1,064
*Mars Poultry Farm	Do.	109	1,041
T. Hindley	Do.	67	1,041
*W. H. Reilly	Chinese Langshans	104	1,010
*W. Smith	Black Orpingtons	87	993
A. Shanks	Do.	103	986
E. M. Larsen	Do.	116	975
*J. W. Macrae	Do.	76	930
T. W. Lutze	Do.	88	910
*F. A. Claussen	Rhode Island Reds	63	775
Jas. Fitzpatrick	Do.	84	726
H. Puff	Do.	77	720
W. J. Mee	Black Orpingtons	44	710
Totals		6,228	66,899

* Indicates that the pen is taking part in single hen test.

DETAILS OF SINGLE HEN TESTS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	203	222	254	210	228	256	1,373
G. W. Hindes	245	212	203	222	214	201	1,297
E. Chester	226	206	203	228	213	201	1,277
T. Fanning	217	195	226	168	218	216	1,240
W. Becker	203	208	185	221	185	211	1 213
C. P. Buchanan	171	205	205	200	215	202	1,198
Mrs. L. Henderson	208	177	201	167	227	211	1,191
Geo. Prince	177	218	189	219	193	193	1,189
G. H. Turner	138	147	225	217	255	202	1,184
W. Lyell	190	216	211	187	189	182	1,175
Geo. Howard	190	183	207	220	176	188	1,164
E. A. Smith	174	219	192	190	199	177	1,151
L. G. Innes	206	211	248	126	142	203	1,136
Dr. E. C. Jennings	161	237	202	173	195	166	1,134
Oakland Poultry Farm	164	190	205	195	198	181	1,133
C. Knoblauch	205	181	207	176	158	194	1,121
R. Holmes	204	208	177	178	169	181	1,117
Quinn's Post Poultry Farm ...	221	172	170	142	214	174	1,093
Range Poultry Farm	114	224	165	200	192	196	1,091
O.K. Poultry Yards	160	198	200	162	195	167	1,082
Thos. Taylor	147	196	183	170	192	193	1,081
Mrs. A. T. Coomber	162	201	177	189	136	190	1,055
J. M. Manson	217	189	210	152	133	151	1,052
Homalayan Poultry Farm ...	201	172	158	146	187	168	1,032
Mrs. R. Hunter	157	174	116	173	191	190	1,001
J. Zahl	204	160	182	184	150	101	981
C. Porter	145	169	164	168	110	197	953
T. B. Hawkins	188	132	176	146	145	151	938
J. W. Newton	177	205	109	122	169	125	907
HEAVY BREEDS.							
Nobby Poultry Farm	240	213	193	115	220	235	1,216
D. Fulton	237	182	178	179	150	232	1,158
R. Burns	164	191	155	173	235	184	1,102
E. F. Dennis	213	165	181	121	203	189	1,072
E. Morris	154	169	193	216	186	152	1,070
A. E. Walters	155	198	138	201	195	177	1,064
Mars Poultry Farm	186	190	165	178	159	163	1,041
W. H. Reilly	175	183	176	137	144	195	1,010
W. Smith	227	169	119	162	142	174	993
J. W. Macrae	109	133	171	160	183	174	930
F. A. Claussen	131	130	133	139	137	105	775

SELECTION.

THE STANDARD FOR UTILITY BREEDS AS ADOPTED BY THE NATIONAL UTILITY POULTRY BREEDERS' ASSOCIATION OF AUSTRALIA.

GENERAL APPEARANCE.—Bright, active, and healthy. The first essential—a well-developed, vigorous constitution, giving evidence of ability to transmit similar qualities.

Comment.—There is little doubt that the "ground" selection, *i.e.*, choosing the birds by appearance first, is the most valuable part of the business, for if the bird does not please the eye, she or he has no right in the breeding pen. To breed from an unhealthy, undersized, or poor constitutioned bird, merely on pedigree or performances, is only to court disaster.

HEAD.—Rather long in light breeds, and lean, narrowing somewhat at the back of the skull. Heavy breeds shorter in skull, and fractionally deeper.

Comment.—Fineness of skull is imperative for a good layer. Coarseness in skull is not commensurate with heavy laying. The skull will thicken with age, and it is desirable it should be as fine as possible at the back, just where it joins on the vertebræ of the neck. The heavy breeds are naturally shorter skulled (though deeper through), and the tendency to breed longer skulls in heavy breeds should be sternly suppressed, the snaky-headed ones, ultimately breeding weaker constitutioned birds, are liable to moult earlier, and less likely to lay through the moult.

EYES.—Full and bright; colour, rich orange red, except in the cases of certain breeds as Black Orpington, Langshan, Minorca, &c., where such eyes should be dark brown, as almost to appear black.

Comment.—It is said of human beings that the eyes are the windows of the soul. Certainly, with utility fowls, roundness and prominence of the eyes are indicative of vitality and fecundity. In light breeds the straw-coloured eye gives a sour appearance, and is indicative of lack of constitutional vigour. With age, the eye sinks into the skull, hence the desirability to avoid any measure of space from the eye to the back of the nostril, tending to increase the orbital cavity, and later on to accentuate the sunken appearance.

FACE.—Bright and clean; free from feathering.

Comment.—The bright red colour of the face indicates a robust constitution and sound general health. Experience has shown that the best layers are invariably "clean faced," *i.e.*, free from face feathering.

COMB.—Thin and fine in texture, thickening as little as possible towards the base. Dubbing to be recognised in the case of second season or older roosters in the light breeds.

Comment.—Heavy laying and coarseness cannot go together, but the comb thickens with age, and also with the use of forcing foods, such as meat; in consequence of which, stud roosters, particularly when meat fed to increase vigour, will develop very large combs. A considerable drain on the system is entailed by supplying the necessary vigour, in the shape of blood, to support such comb; consequently, stud breeders usually remove the comb in order to increase vitality, and consequent fertility, during the breeding season. Whilst to those experienced, the operation of removing the comb—dubbing—is simple, it is one rarely undertaken by the farmer; consequently the stud breeders have mostly adopted the habit of sending out cockerels already dubbed.

WATTLES.—Thin, and of finest texture.

Comment.—As in the case of the comb, the fine quality is eminently desirable. The wattles, which grow to a considerable size in the case of roosters, are also removed by some breeders along with the comb, and although somewhat altering the appearance of the bird, is rather an advantage on a farm where there are a number of roosters, some of which may be rather pugnacious.

NECK.—Fine and fairly long.

Comment.—Here again the reiterated desire for fineness and quality asserts itself. A short-necked bird is almost invariably thick-necked.

BODY.—Long, deep, and wedge-shaped, similar to that of the milch cow; wide across the saddle.

Comment.—However good a hen is, if small and undersized, we would prefer not to breed from her, as strength and soundness of constitution are imperative for subsequent stud purposes. Spring of rib is also important; a flat-sided bird lacks constitution.

BREASTBONE.—Straight and fine.

Comment.—A crooked breastboned bird should be rejected for breeding purposes, this being an indication of hereditary weakness, and although it may have been caused by the bird being allowed to perch at too young an age, before the bone had hardened, there is nothing to indicate which is the real cause of this deformity.

PELVIC BONES.—Thin, pliable, fairly long and straight, set at considerable distance from the point of breastbone.

Comment.—But little importance can be attached to the distance between the bones themselves, as so much depends upon the proximity to the laying of the next egg. Just as in the case of the cow about to calve, we notice a relaxation, *i.e.*, "giving" of the bones, so do the pelvic bones widen for the laying of the egg in the case of the hen. Fineness of the bones is a distinct indication of quality, and although there is, with age, a gradual thickening of the bones, it is usually more marked in poorer layers. It is by no means uncommon to find one bone thicker than the other, in which case we have usually noticed that the right pelvic bone is the thicker of the two. Incurvation is commonly met with, and this may easily be caused by overcrowding in the brooder, when the bones are easily distorted. The distance from the breastbone to the pelvic bones is of considerable importance, as without good space there, there must be a small abdominal cavity. The advantage of this space is to leave plenty of room in the hen for the development of a number of yolks of a fairly even graduation, and so maintain a weekly output of five or six eggs; with a narrow space, fewer yolks can develop at a time. This is a strong argument in favour of handling the male bird, which is, unfortunately, not yet a common enough practice. "Like begets like," and using a narrow-spaced rooster will inevitably result in a certain proportion of narrow-spaced birds amongst his stock.

SKIN.—Texture of skin of abdomen to be of thinnest and finest quality; very elastic.

Comment.—The texture of the skin of the abdomen varies in accordance with the laying condition of the hen, but fineness and pliability are very desirable. A dairyman will frequently in the market test the fineness and pliability of the skin on the ribs of a cow; any tendency to being hidebound, or even coarse skin, being a common cause of rejection.

LEGS.—Not high, and set well apart.

Comment.—Width between the legs is necessary for a bold and vigorous stance; a narrow-legged bird, if lanky, is likely to be knock-kneed and lacking in stamina. It is noticeable with the yellow-legged varieties that, after a period of laying, the yellow colouring gradually disappears, the best layers losing the leg colouring first. The colour returns, however, when the bird ceases laying and moults.

TAIL.—Full and flowing, not set at too high an angle, with good sickle and hackle feathers.

Comment.—While the carriage of the tail has little or no effect upon egg production, a high tail carriage, or "squirrel tail," detracts greatly from the bird's appearance.

FEATHERS.—Profuse, but close and flat on the bird.

Comment.—The tighter or closer feathered the bird is, the warmer she will be in the winter, consequently requiring less of the food consumed to maintain the body heat, and thereby rendering more available for egg production. The loose-feathered bird is colder, and more liable to moult earlier, and is also much more likely to go broody. In connection with the moult, a good deal depends upon the nature of the moult. A good layer, tight-feathered, will go bare and red about the head, but moults gradually, causing less drain on the system of the bird, and enabling her to continue laying. The full "quill" moult leaves the bird colder—a drain, consequently, upon the food supply—and constitutes a further drain for the formation of a complete set of new feathers all at the one time.

Dairying.

CALF FOODS.

By J. C. Brunnich, F.I.C., Agricultural Chemist.

The economic feeding of calves, aiming at the rearing of strong, healthy animals, without the use of cow's milk, is one of the biggest problems of the dairy farmer and stockbreeder, as good stock and superior milkers can never be made out of poorly fed calves.

The use of whole milk, undoubtedly the best food for young calves, is, on account of its great value, greatly restricted. In the districts with butter factories, skim milk for the feeding calves is available; in districts with cheese factories only, whey can be returned to the farmer; and in districts with condensed milk factories and where milk is produced for town supplies, a part of the whole milk, as much as can be spared, must be used for the calves.

In all these cases the food must be supplemented with concentrates, and with careful choice and use of such foods good results can be obtained.

When properly fed a thrifty calf should gain from 1½ to 2 lb. daily in weight for the first 4 to 6 months, and when feeding with whole milk, of average quality, not too rich in fat, for every 1 lb. increase in weight about 1 lb. of milk solids are required, or for the average daily increase of 1½ lb. of young calves about 11 lb. (or about 1 gallon) of whole milk are necessary. Very young calves require from 5 to 6 lb. of milk daily.

Skim milk is a much more nitrogenous food than whole milk, and must therefore be supplemented by carbonaceous concentrates, containing a fair amount of easily digestible oils or fat. After a calf is from two to four weeks old skim milk may gradually replace whole milk, so that after about ten days skim milk alone is used, and a calf six weeks old may get from 18 to 20 lb. (1¾ to 2 gallons) daily.

The skim milk must be warmed and fed at about blood heat until the calf is four months old.

Whey contains only small amounts of nitrogenous matter and fat, and must be supplemented by concentrates rich in protein. It is only a poor food for calves, and must be used with care, and as fresh as possible.

A great many food mixtures have been experimented with and are recommended for calf feeding, like ground oats, ground oats and bran, corn meal, bran and linseed meal, &c., &c. In many cases corn meal alone has been used, or mixed with pollard, and particularly kafir corn meal has been used with excellent results.

Cottonseed meal cannot be recommended as a calf food, but all other oilcakes like linseed, cocoanut, and peanut cake and meals are excellent foods, as well as the by-products polly meal, germ meal, maize oil meal, obtained from corn.

Supplementing skim milk the following amounts of suitable concentrates, divided over two or three meals, should be used daily:—

For Calves 3 weeks old, about 5 oz.
For Calves 6 weeks old .. ½ lb.
For Calves 2 months old .. 1 lb.
For Calves 3 to 5 months old 2 lb.

A large number of calf foods are on the market, and in spite of the very high price asked for such foods, and the most extravagant claims advanced by the manufacturers, not one can be considered an absolute substitute for milk.

Farmers are frequently induced to buy such foods, notwithstanding the exorbitant price, deluded by glowing descriptions of such foods, their claimed value as complete substitutes for milk, and their supposed action as preventives for all sorts of ailments and diseases.

In a few cases fair results with the use of such proprietary foods have been reported, but such results are frequently based on comparisons between the systematic use of a fair amount of such foods and the spasmodic use of little or no food, which was, perhaps, quite unsuitable, whereas by feeding the calves with homemade mixtures of meals excellent results would have been obtained.

Similar troubles with proprietary calf and stock foods will exist anywhere if the sale of such stock foods is not regulated by legislation.

It will be of interest to quote here the results of calf-feeding experiments made a few years ago in Ireland, which were published in the "Reports of Proceedings under the Fertilisers and Feeding Stuffs Act, 1906," by the Department of Agriculture and Technical Instruction for Ireland. The results of these experiments warranted the publication and wide distribution of the following poster:—

Department of Agriculture and Technical Instruction for Ireland.

Caution.

CALF MEALS.

FARMERS
are
WARNED
that
INFERIOR and Expensive Calf Meals are at present being SOLD in Ireland.

Read Leaflet No. 54.
&c., &c.

For these feeding experiments a calf meal described as a "milk substitute," was used in comparison with a home-made calf meal mixture, recommended by the Department, and consisting of 2 parts of maize meal, 2 parts oatmeal, and 1 part crushed linseed. The "milk substitute" was sold at the exorbitant price of 28s. per cwt., and according to analysis made, contained 20.56 per cent. of crude proteids and 4.09 per cent. of crude oil or fat, and was only worth about 8s. per cwt.

For this experiment eight young calves, as nearly alike in age and type as possible, were selected and divided into two lots of four each. Lot No. 1, was fed on "milk substitute" in accordance with the directions of the manufacturers, and Lot No. 2 with the departmental home-made meal.

During the first fortnight both lots were fed on whole milk and the increase in weight was as follows:—

	Lot No. 1.	Lot No. 2.
	lb.	lb.
1st fortnight	67	53

The comparative trials now commenced showing the following increases:—

	Milk substitute.	Home-made meal.
	lb.	lb.
2nd fortnight	6	85
3rd "	11	87
4th "	30	89
5th "	17	92
6th "	15	84
7th "	29	104
8th "	26	103
9th "	18	88
10th "	36	114
Total	188	843
	£ s. d.	£ s. d.
Total cost of feeding ..	9 1 2½	10 8 3½;
or cost per cwt. live weight increase	3 19 7	1 6 0

A second series of experiments with six calves, three of which were fed with "milk food for calves" and three with separated milk and abovementioned home-made meal, were just as interesting and instructive.

The increase in weight during the first twelve days was exactly 66 lb. in each lot. After eight weeks of trial the increases were:—

Lot I. (fed with milk food) .. .. 13 lb.
Lot II. (fed with home-made meal) .. .. .. 234 lb.

The cost of the feeding for the eight weeks amounted to £2 19s. 3d. for Lot. I. and £3 3s. 6d. for Lot. II.

Calf No. 1. Calf No. 3.

PLATE 8.—CALF-FEEDING EXPERIMENT.
Photograph taken at commencement of Experiment.

Calf No. 1. Calf No. 3.

PLATE 9.—CALF-FEEDING EXPERIMENT.
Photograph taken at conclusion of Experiment.

The cost per cwt. of live weight increase works out at £25 10s. 5d. for Lot I., and £1 10s. 5d. for Lot II.

Copies of the photographs taken before and after conclusion of the trial strikingly show the difference in the appearance of the calves.

The veterinary surgeon reported the calves of Lot I. to be unhealthy, emaciated, dull, and depressed, whereas the calves of Lot II. were healthy and thriving.

The calves of Lot II. were absolutely unsaleable. A continuation of the feeding of Lot I. with "milk food" would have been followed by fatal effects, and the calves were therefore put back on whole milk and home-made meal; the increase in weight in four weeks amounted to 99 lb., which shows that the animals began to thrive as soon as they received suitable feeding.

A good number of dairy farmers recommend to feed concentrates, like crushed oats, oatmeal, and pollard, corn meal, kafir corn meal, &c., in a dry form, after the calves are from four to six weeks old. This teaches the calves to eat, and readily appreciate grass, hay, and even silage and roots.

A calf-feeding experiment carried out at the Woburn Experiment Farm, in England, 1912-13, shows the advantage of dry feeding.

Twenty Shorthorn bull calves were selected and fed for the first three weeks on whole milk, and then divided into five lots of four calves each, fed as follows:—

Lot 1.—Cod liver oil and separated milk.
Lot 2.—A purchased "calf meal" and separated milk.
Lot 3.—Gruel from linseed and oatmeal and separated milk.
Lot 4.—Whole milk.
Lot 5.—Crushed oats (dry) and separated milk.

The last lot gave the highest gain in live weight at the lowest cost per lb. of increase during the nine weeks' trial. The next highest gain was with whole milk, but at greatly increased cost.

At the end of the trial the calves were turned out and all fed alike on separated milk, with a little linseed cake and crushed oats. On conclusion of the experiments Dr. Voelcker reports "that not only did the crushed oats and separated milk feeding (giving to each calf 1½ gallon of separated milk and 1 lb. of crushed oats daily) give the highest gain at lowest cost (1.9 lb. daily at a cost of 2.52d.) during the feeding of nine weeks with the special foods, but that subsequently, when the calves were turned out on the field and all fed alike, the gain of live weight continued to be higher with this feeding than with any other food. This improvement was maintained for a period of seven months after the special feeding had been dropped (the average gain per head daily for the whole period of seven months was—Lot 1, 1.74 lb.; Lot 2, 1.62 lb.; Lot 3, 1.84 lb.; Lot 4, 1.94 lb.; and Lot 5, 2 lb.)."

The next best results were obtained with whole milk calves, and they looked the best of all the lots, having more "bloom" on them than any of the others. The crushed oats lot similarly stood out above the remainder, and undoubtedly the poorest of all were the "calf meal" lot.

The feeding problem becomes more difficult when no separated milk is available, and it is therefore of interest to record that Mr. Cochrane, of Wyreema, had good results with rearing of sturdy and vigorous calves by using a small amount of whole milk and a meal made by mixing two parts of wheat meal and one part of maize oil meal.

The Standard Dairy Company issued a circular to the suppliers recommending the adoption of Mr. Cochrane's method of feeding:—

"For each calf mix from ½ to 1 of the 'meal' to a fairly thick paste with cold water, then add boiling water gradually, stirring the while, so as to make 1 gallon of food; add to this 2 pints of milk and allow to cool. This is a sufficient daily ration for each calf, and is suitable until the calf is two months old; the quantity of added milk is then reduced, feeding on green foods or hay commenced and gradually increased with a proportional decrease in the amount of 'meal' until, at the age of three months, no 'meal' food is necessary."

The amount of food given is unquestionably the minimum amount on which any calf could be reared, as with the lower amount of meal the calf gets only ¾ lb. of solid matter and with the higher amount only 1¼ lb., so that the average daily increase of live weight of 1½ lb. cannot possibly be obtained.

A comparison of the various methods of feeding described clearly shows that no hard-and-fast rule can be laid down for the feeding of calves, and much is left to the judgment of the feeder, who must study local conditions and individual requirements.

From a practical point of view, the dairy farmer will naturally ask what concentrates are available for calf feeding and what is their relative cost.

The principal calf-food meals on the market have been analysed, as well as the most important concentrated foodstuffs, and the results of analysis tabulated and given herewith. The value of a food depends principally on the amounts of digestible protein, or flesh-forming nutrients, the digestible carbohydrates and fats, or heat and fat producing nutrients, and lastly, on the mineral matter contained in the ash, supplying the necessary amounts of lime, phosphoric acid, salt, &c.

The composition of the home-made meal recommended by Department of Agriculture and Technical Education of Ireland may be taken as a basis for the feeding of calves in combination with skim milk, and its composition is closely approached by the mixed meal used by Mr. Cochrane and also by a high-grade pure oatmeal. Mr. Cochrane's mixture is rather low in fat, and its chief drawback lies in the fact that it contains a very insufficient amount of lime.

The variation in the composition of the commercial calf foods is quite extraordinary, as the amounts of digestible protein vary from 5¾ to 21 per cent., and the amounts of fat from ¾ to 7½ per cent. Only two of the foods contain a barely sufficient amount of fat, and only one is a little superior to ordinary pollard, and not one of them can be called a "milk substitute." One of the foods actually contains nearly ⅓ of its weight of ash, chiefly consisting of common salt.

But when considering the actual cost of the foods, the results of comparison are absolutely startling. To compare the actual relative pecuniary values, the unit values of food are first calculated by multiplying the most valuable constituents, digestible protein and fat, by 2½, and then adding the amount of digestible carbohydrates, including digestible fibre. Dividing the food units into the cost of food per ton (average wholesale cash prices) the cost per unit is obtained.

Even with the abnormal conditions existing at the present time, the prices per unit for the ordinary concentrated foods are not too high, and compare favourably with the prices existing elsewhere. But the price asked for all the commercial calf foods is absolutely exorbitant and from three to four times their real value.

Calf food C, for instance, which has to be absolutely condemned for the fact alone that it contains less than ¾ per cent. of fat, costs actually 8s. 3d. per unit, which is higher than the most expensive and valuable of calf foods—cow's milk.

COST OF CALF FOODS, MEALS, ETC.

——	Food Units.	Average Normal Cost per Ton, 1914.	Cost per Unit.	Present Cost per Ton, 1918-19.	Cost per Unit.	English Price, May, 1916.*
		£ s. d.	s. d.	£ s. d.	s. d.	s. d.
Calf Food A ..	87·0	?	?	23 10 0	5 5	..
„ B ..	86·8	21 12 0	5 0	21 12 0	5 0	..
„ B2 ..	76·1	?	?	21 12 0	5 8	..
„ C ..	93·4	?	?	38 1 6	8 3	..
„ E ..	90·7	35 0 0	7 9	35 0 0	7 9	..
„ F ..	105·4	40 0 0	7 7	40 0 0	7 7	..
Linseed (crushed)	130·2	25 0 0	3 10	32 12 0	5 0	..
Meggitt's Meal ..	108·8	?	?	9 10 0	1 9	1 11
Maize Meal ..	91·8	10 0 0	2 2	20 0 0	4 4	2 10
Sunlight Oilcake ..	96·7	?	?	10 0 0	2 1	2 0
Key Meal ..	100·5	?	?	7 0 0	1 5	..
Polly Meal ..	105·3	?	?	10 12 0	2 0	2 5
Bran	81·8	4 15 0	1 2	7 15 0†	1 11	1 11
Pollard ..	89·5	5 2 6	1 2	7 15 0†	1 9	2 1
Milk ..	22·5	?	?	9 0 0‡	8 0	..

* According to Professor T. B. Wood in "Science and the Nation."

† State Produce Agency price, Feb., 1919.

‡ Milk at 10d. a gallon, price paid by condensed milk factories.

It is very fortunate that the farmer has the remedy to obtain cheap calf foods in his own hands, as the concentrated foods like linseed meal (Meggitt's meal), coconut oil cake (Sunlight oil cake and Key meal), by-products from corn (polly meal, maize oil meal, &c.), and even bran and pollard, are obtainable at very reasonable rates.

COMPOSITION OF CALF FOODS CONCENTRATES, MEALS, MILK, ETC.

	ANALYSES OF FOODSTUFFS.									DIGESTIBLE NUTRIENTS.						
						Crude Ash.										
	Water.	Crude Protein.	Carbohydrates or N Free Extract.	Crude Fibre.	Crude Fat.	Total.	Insoluble.	Lime, CaO.	Phosph. Acid, P_2O_5.	True Protein.	Carbohydrates or N.F.E.	Fibre.	Fat.	Nutritious or Albumin. Ratio.	Starch Value.	Food Units.	
	%	%	%	%	%	%	%	%	%	%	%	%	%	1 ÷			
Calf Food A	8·51	12·50	63·43	5·67	5·45	4·44	·46	·14	·74	8·00	51·38	1·77	5·49	8·6	73·0	87·0	
,, B	10·81	11·13	67·39	4·70	4·09	1·88	·34	·11	·50	8·73	54·58	1·55	3·52	7·6	72·1	86·8	
,, B, 2nd Sample	9·75	10·91	67·39	3·15	3·30	5·50	2·91	·32	·67	5·76	54·59	1·04	2·84	10·8	67·3	76·1	
,, C	9·47	29·25	45·07	8·60	·83	6·78	·87	·39	1·90	20·90	36·51	2·84	·71	2·0	59·8	93·4	
,, D	8·27	10·31	30·65	17·60	5·20	27·97	2·13	·56	·59	7·48	24·83	5·81	4·47	5·5	47·7	59·5	Ash contained 18·5 per cent. of salt
,, E	8·38	17·75	58·64	4·40	4·93	5·90	·32	·84	1·49	12·45	47·50	1·45	4·24	4·7	69·9	90·7	
,, F	7·51	19·25	53·24	6·39	8·69	4·92	·26	·73	1·66	12·61	53·12	2·11	7·47	5·8	83·8	105·4	
Home-made Meals—																	
Irish Mixed Meal	9·25	14·50	54·82	7·28	10·91	3·24	1·06	·34	·52	8·87	46·70	3·08	9·16	8·0	77·6	97·7	2 p. oats, 2 p. maize, and 1 p. linseed
Cochrane's Meal	8·40	14·03	64·50	4·35	7·00	1·72	·06	·08	·64	9·91	54·18	1·78	5·25	6·9	77·0	93·9	2 p. wheat and 1 p. maize oil meal
Concentrates and Meals—																	
Linseed, crushed	6·65	18·31	32·08	6·38	32·40	4·18	·68	·50	1·19	12·23	24·70	3·64	28·51	7·7	104·9	130·2	
Linseed Meal, Meggitt's	9·50	26·63	35·86	9·70	11·85	6·46	1·24	·67	1·72	19·86	27·61	5·54	10·42	2·9	74·0	108·8	
Maize Meal	10·65	10·50	67·57	5·21	4·55	1·52	·06	·13	·40	7·37	62·84	3·02	3·00	9·9	79·4	91·8	
Sunlight Oilcake	10·80	17·50	44·25	12·85	9·00	5·60	·28	·67	·88	12·89	36·29	7·32	8·37	4·9	74·5	96·7	
Key Meal	8·75	18·37	43·45	13·35	9·90	6·18	·14	·50	·88	14·06	35·63	7·61	8·45	4·5	75·5	100·5	
Polly Meal	8·05	19·81	61·31	5·50	3·65	1·68	·26	·16	·54	15·92	57·02	3·19	3·14	4·2	81·8	105·3	
Bran	11·00	15·90	55·40	8·20	4·90	4·60	·18	·36	2·00	11·40	41·60	2·20	3·80	4·6	62·7	81·8	
Pollard	10·50	17·40	56·80	6·00	4·90	4·40	·17	·35	1·88	12·40	46·00	2·00	4·20	4·7	68·9	89·5	
Milk	87·2	3·6	4·8	..	3·7	·7	..	·17	·15	3·4	4·7	..	3·7	3·9	16·2	22·5	Average analyses
Skim Milk	90·4	3·8	5·0	..	·1	·7	..	·17	·15	3·6	5·0	..	·1	1·4	8·6	14·3	
Whey	92·7	1·0	4·9	..	·8	·6	..	·15	·13	·9	4·9	..	·8	7·4	7·6	9·2	

Viticulture.

THE SEEDLESS RAISIN GRAPES.

The following notes on seedless grapes, by Frederic T. Bioletti, form the subject of Bulletin 298, issued by the University of California, will doubtless prove of interest to vignerons in Queensland:—

TYPES OF RAISINS.

The raisins of the world are of four main types: (1) of large size, made principally from the Muscat of Alexandria grape and known generally as *Muscat* or *Malaga* raisins; (2) of medium size, light coloured and seedless, made principally from the Sultanina grape and known generally as *Sultana* raisins; (3) of small size, dark coloured and seedless, made principally from the Black Corinth grape and known in English as *Currants;* (4) of various sizes, colours and qualities, and made from almost any vinifera varieties, and usually known as *Dried Grapes.* The last are not usually classified as raisins. There are numerous subdivisions and modifications of these types. This publication deals with the second and the third types.

Statistics.—The principal raisin-producing countries of the world are Greece, California, Turkey, Spain, and Australia. Their comparative importance is shown by the following figures:—*

WORLD'S PRODUCTION OF RAISINS IN 1913.

Principal types.	Country.	Tons.	Per cent. of total.
Muscats and Sultanas ..	California ..	65,000 ..	22
Currants	Greece ..	180,000 ..	60
Sultanas	Turkey ..	23,000 ..	8
Muscats	Spain ..	20,000 ..	7
Muscats and Currants ..	Australia ..	14,000 ..	5

The California crop increased from 40,000 to 128,000 tons (220 per cent.) between 1904 and 1915. During the same period, the crop of Australia increased 136 per cent., while that of Spain decreased 26 per cent. Those of Turkey and Greece were practically stationary. In 1916, California produced about one-half the raisins of the world.

VARIETIES.

Seedless raisins are made from four varieties of seedless grapes: Sultanina, Sultana, Black Corinth, and White Corinth. Other seedless or nearly seedless grapes are grown as table grapes and might be used for making seedless raisins but for the superiority of the varieties mentioned. These other varieties are: The Rose Sultanina, the Giant Sultanina, and the Black Monukka. Seedless raisins of a type peculiar to California are also made from the abortive, seedless berries ("shot grapes") which occur commonly on the Muscat of Alexandria and which are separated in the cleaning and grading of Muscat raisins.

The various seedless grapes and their uses are shown in the following table:—

SEEDLESS GRAPES AND THEIR USES.

Name of grape:	Use:
Sultanina	Sultanas of commerce
Sultanina, Rose	Table grape
Sultanina, Giant	Curiosity of collections
Sultana	Inferior Sultanas of commerce
Black Corinth	Currants
White Corinth	Inferior currants
Black Monukka	Table grape
Muscat ("shot grapes)	Seedless muscats

Sultanina.—Synonyms: Thompson, Thompson's Seedless (in California), Lady de Coverly (English hot-houses), Sultanieh, Oval-fruited Kishmish (Turkey, Palestine). This variety is grown in collections or in small quantities as a table grape throughout the Mediterranean region. It is grown largely in the Levant, more

* All statistics are quoted or calculated from those given by George Robertson in the Statistical Report of the State Board of Agriculture for 1916.

particularly in the warmer parts of Asia Minor, as a raisin grape. It appears to be widely distributed in Asia as far east as Persia and probably beyond. From it are made the genuine *Sultana* raisins of Smyrna.

It was brought to California in 1872 by Wm. Thompson, senr., of Sutter County, who obtained it from Ellwanger and Barry, of Rochester, New York, under the name of Lady de Coverly, a name by which it is known in English hot-houses. It was distributed here under the name of Thompson's Seedless to distinguish it from the Seedless Sultana, a grape grown more sparingly in the same Asiatic regions. Its name of Sultanina, by which it is known in most countries, or Sultanieh, as it is sometimes spelled, is derived from the town of Soultanieh in Persia.

Mr. Thompson deserved great credit for having introduced this valuable grape into California, but it seems hardly necessary or desirable to change the euphonious and appropriate name by which it has been known in most of the regions where it has been grown probably for hundreds of years.

The vine is remarkably vigorous, producing canes in rich soil often 30 ft. long. These canes are often comparatively thin and slightly flattened for a foot or so near the trunk and become rounded and much thicker in their middle portion. The joints are very long, and strong laterals are produced abundantly, especially when the growing shoots are pinched or topped.

The bunches are very large, conical, and usually well filled. The berries are oval, yellow, and small to under medium in size. They are perfectly seedless, without marked flavour, and low in acidity.

Rose Sultanina.—Synonym: Sultanina Rosea. This is a mere colour variation of the last with which it is identical in all respects but the colour of the fruit. It was imported from Italy by the United States Department of Agriculture in 1900. It is numbered 5616 (3921) in the list of plant introductions published by the Department. It is known in European vine collections and appears to have been brought to Europe from some part of Anatolia (Asia Minor).

Raisins have been made from it, but they are inferior in colour to those made from the ordinary or white Sultanina. As a table grape, it is very attractive when it attains its full, bright rose colour. In the hotter regions of the State, as in Imperial, Fresno, and Yolo counties, it remains white or only faintly pink and is less attractive in appearance than the ordinary form. It develops a most brilliant colour in Sonoma County, and probably would do so in any of the cooler grape-growing regions.

Giant Sultanina.—Occasionally, a vine of Sultanina is found showing a remarkable hypertrophy of all its parts. The berries are round and nearly as large as those of Muscat. The peduncles, canes, joints, pith, and leaves also show this enlargement. Vines obtained by grafting or rooting cuttings from this form retain its peculiarities. The vine appears to be a bud sport showing the characteristics of what the biologists call "gigantism." No indications have been found as to whether all the vines originated from a single parent vine or whether they had independent origins. All the specimens seen seem to be identical in their characters.

It is possible that this vine has given rise to the legend of a seedless Muscat. It has, however, none of the flavour or other characteristics of the Muscat and, in fact, in spite of its marked peculiarities, no one familiar with varieties of vines would fail to recognise it as a form of the Sultanina. It is now growing at the experiment vineyard at Davis, but the crops so far have been small and irregular. It appears to lack vigour and is somewhat difficult to propagate.

Similar cases of gigantism have been noted with Muscat of Alexandria, Flame Tokay, and Zinfandel. It seems probable that it is a variation similar to that of the Nectarine and that it may occur with any variety. All the varieties in which it has been noted are grown in large quantities, which would increase the chance of finding a very rare variation.

Sultana.—Synonyms: Seedless Sultana (in California), round-berried Kishmish (French ampelographies). This grape was introduced very early into California by Mr. West, a Stockton nurseryman. Under the mistaken impression that it was the variety from which the Sultana raisins of commerce were made, it was distributed under this name. This is unfortunate, as the name became fixed in popular use here before the Sultanina, the real variety producing Sultana raisins, was introduced.

The grape seems to have been introduced into Europe from Asiatic Turkey. In Turkish any seedless grape or raisin is called *Kishmish*, and two varieties are recognised, the "round-fruited," which we call the Sultana, and the "oval-fruited," which is the true Sultanina, and which we call the Thompson.

The vine resembles the Sultanina in its vigour and general aspect. It is a little less riotous in its growth and a little more inclined to be fruitful, even with defective pruning.

The bunches are very large, compact, and of a very characteristic shape. The central part is remarkably long and perfectly cylindrical, and the upper part very heavily shouldered. The berries are wider than they are long and slightly flattened at the apex. In flavour and colour, they resemble the Sultanina, but are inclined to have a higher acidity. A seed is found in an occasional berry.

Black Corinth.—Synonyms: Zante Currant, Panariti (?), Passerina nera (in Italy). This variety was early introduced into California and planted in various places in the Sacramento and San Joaquin valleys. Later introductions by the United States Department of Agriculture were widely distributed. Unlike the Sultanina, it was never largely planted, as no one until lately had been able to make it produce paying crops. By severe annual ringings of the main trunk, it has been made to produce satisfactorily in Australia, and fair crops have been obtained in the University experiment vineyards by grafting it on resistant stocks.

The vine is of great vigour, and the trunk will grow a hundred or more feet in length if given the opportunity. Under some conditions, apparently when it is allowed to grow to very large size, many or most of its berries grow large and develop seeds. In such cases, it is of no value as a raisin grape. It is from this variety that the so-called Zante or Greek currants are made.

The bunches are of medium size, compact, and cylindrical, with well-marked shoulders and sometimes winged. The berries are very small, no larger than elderberries, reddish black, round, and seedless. Occasionally a berry containing seeds is found.

White Corinth.—Synonym: Passerina bianca (in Italy). This variety resembles the last one in many of its characteristics. It is, however, more easily made to bear good crops, and several small vineyards of this variety have been in existence in the Sacramento Valley for many years. It will bear on its own roots and with the same treatment that succeeds with the Sultanina.

The vine is nearly as vigorous at the Black Corinth, the leaves are a little lighter in colour, and the fruit is white. The bunches are medium or a little larger than those of the black and more conical in shape. The berries are a little larger, intermediate in size between the Black Corinth and the Sultana. They are rounded and slightly flattened like the latter variety. They lack the flavour and acidity of the black. When dried they make an excellent currant, but not equal to the black. The dried fruit is intermediate between a currant and a Sultana, and while intrinsically of good quality, it must be marketed as a second-grade currant or Sultana.

Red Corinth.—Synonym: Passerina rosa (in Italy). This variety does not seem to have been introduced into California. Some vines called by this name are simply Black Corinth, which, owing to peculiarities of local soil or climate, do not develop their full colour.

Black Monukka.—This is a recent introduction of the United States Department of Agriculture. According to A. F. Barron, it came originally from India. It is the largest of the group, but is not perfectly seedless. It is an excellent table grape, and will probably ship well. It is not promising as a raisin grape.

Seedless Muscat.—There have been rumours for many years that a large seedless Muscat is grown in Chile, but no one has been able to obtain any for California. It is not likely that such a variety exists. A seedless grape is a defective grape, that is, one which has not developed the physiologically essential part of the fruit, the seed, and this defect seems to be correlated with small size. The seedless Muscats are grapes which have been imperfectly pollenised, and in some seasons they occur in large numbers on most bunches, but it is rare that they constitute all the berries of a bunch. This condition is called by French grape growers "millerandage," and by California grape growers "shot grapes." It occurs sometimes with nearly all varieties.

A CORRECTION.

In our statement of the Cotton Production in Queensland for the past four seasons, the amount of raw cotton received at the Departmental Ginnery in 1914 was set down as amounting to 94,445 lb. This should have read 9,445 lb.

Tropical Industries.

THE CULTIVATION OF SUGAR-CANE IN QUEENSLAND.

By Harry T. Easterby, General Superintendent, Bureau of Sugar Experiment Stations.

PART 1.

There are now so many persons in Queensland who in recent times have commenced the growing of sugar-cane without a great deal of knowledge of the subject, and so many others who write to the Bureau of Sugar Experiment Stations for information on the taking up of land and cultivating cane, that it is recognised that a Bulletin dealing with the topic is a necessity. In addition, there are proposals for settling many of our returned soldiers upon sugar lands, and instruction in canegrowing will be needed by them if such schemes are given effect to. It is further hoped that such a Bulletin will be of value to those who have been deriving their living from canegrowing for many years past. Until this Bulletin is issued, it is proposed to publish parts in the "Agricultural Journal."

The man who proposed to grow sugar-cane on a small scale should possess some capital—say, from £300 to £500. If he intends taking up a cane farm on the share system, his capital could be much less. For the purchase of large, well-equiped farms as going concerns, much more money is required, though even many of these are frequently sold to a good man for a comparatively low deposit, and the balance is repayable over a long term. This has been freely done on the Herbert and Johnstone rivers, particularly to Italians. In the case of returned soldiers, special terms will no doubt be granted.

(*a*) Taking up Virgin Scrub Lands.

It is now impossible to secure Crown lands in the vicinity of an existing sugar-mill. Large quantities of Crown lands in the tropical coastal areas of Queensland are eminently adapted for cane. The finest of these lands lie around the Tully, Hull, and Banyan country, and will eventually be used for sugar-growing as it is now proposed to connect this district with the South Johnstone Mill. The best an intending canegrower can do who wishes to commence at once on other than an established farm is to buy land from some private owner.

Before purchasing virgin scrub lands, the nature of the scrub growth, *i.e.*, whether dense or light, large or small, class of timber, whether land is level or ridgy and broken, the depth of soil and whether it is well watered should be taken into consideration. In the Northern sugar districts the scrub is mostly heavy, and consists of such trees as silky oak, bull oak, spurwood, milky pine, water gum, white beech, pencil cedar, maple, bean, china pine, sassafras, penda, Johnstone River hardwood, sour hardwood, lawyer vine, stinging tree, candlenut, yellowwood, lancewood, plum, red cedar, crowsfoot elm, walnut, rosewood, &c. Palm scrubs are not recommended.

The dense tropical scrubs with a good depth of soil should be selected as a rule as, although more costly to clear, the land is of much better quality and will be more permanent. Light red soils of a ridgy nature should not be taken in preference to dark chocolate soils of a level formation.

Southern scrubs are lighter in character than the Northern ones, and the timber usually consists of croton, hoop pine, yellowwood, milkwood, scrub ironbark, fig, white cedar, ash, flindersia, vines, maiden's blush, &c. The nature of the soil, its depth and colour, should be carefully ascertained before purchase.

(*b*) FOREST LANDS.

The best forest lands in North Queensland for sugar-cane carry Moreton Bay ash (or blackbutt as it is sometimes called), acacia, and cooky apple. Other forest country has ironbark, bloodwood, poplar gum, cabbage gum, blue gum, ti-tree, wattle, &c. Country covered entirely with poplar gum is usually shallow, with a stiff clay subsoil. Southern forest lands carry a good many of these trees, though not much poplar gum.

Having purchased land either carrying scrub or forest, the next business is the clearing, and the cost of this operation will vary considerably. In the heavy scrub soils the cost is usually very high. An example may be given from the actual experience of a South Johnstone grower:—

Brushing and felling, £3 10s. to £4 per acre.
Lumping and burning, £2 to £8, according to nature of burn.
Holing for cane plants, 3s. 6d. to 3s. 9d. per 100.
(Men can make from 400 to 450 per day.)

In this case 3,000 holes 14 in. x 9 in. x 9 in. were made per acre.

The land is then ready for planting, the remaining costs being given as under:—

Plants, £2 10s. per acre.
Labour planting £2 10s. per acre.
Road making, £1 10s. per acre.
Chipping, £5 to £10 per acre, according to season.

Cutting cane costs 6d. per ton more than on ploughed ground, the award rate for the North for 15 tons per acre and over being 6s. 9d.

Hauling out, 1s. 6d. per ton.

In the Babinda scrubs the cost of falling, lumping, holing, making roads, planting, fencing, and three chippings has been given at £33, exclusive, of course, of the cost of the land.

The cost of planting cane on the lighter scrubs in Southern districts would, of course, be much smaller, and has been given as under:—

	Per acre.		
	£	*s.*	*d.*
Brushing, felling, clearing, lumping, and burning ..	3	10	0
Holing	2	10	0
Plants	2	0	0
Planting	2	0	0
Chipping three times	4	10	0
	£16	10	0

Scrub lands, after carrying from three to five or more crops, are then usually stumped and put under the plough.

Forest lands are nearly always completely cleared, *i.e.*, they are at once stumped and put under the plough. The cost of clearing forest land varies a good deal, but an average figure would be about from £5 to £10 per acre, according to the nature of the timber. The cost of breaking up further ploughings, and planting of cane would, of course, be additional.

(*To be continued.*)

Science.

THE USE OF THE DIVINING-ROD IN LAND DRAINAGE.

By ARTHUR MORRY.

It sometimes happens that difficulty is experienced in the drainage of land or swampy ground; by reason of insufficient fall to a suitable outlet, surface or underground drains may often be carried great distances before an escape for the accumulated water can be found. Yet it is frequently the case that an outlet exists on the very spot where relief is sought, but this fact is not known through the lack of surface indications.

Geological formations as apparent on the surface do not enable the scientist to indicate underground streams, and although the geologist may occasionally succeed in rendering help to the agriculturist in this connection, it is the so-called water-diviner or hydro-geologist that is capable of rendering most help and of solving what are sometimes very difficult problems.

What this mysterious power is science has not yet discovered; but facts are stubborn things, and proofs of its success are so abundant, and are so continuously being added to, that doubt can no longer exist, except in the minds of those who are prejudiced against anything which cannot be clearly seen or understood.

That a well will take in as much water as it is capable of yielding is known to those who have given any attention to the subject. The well-known law of hydraulics, which is simply expressed in the words "Water will always find its own level," operates also in this matter, and if a well is sunk on an underground stream, and the water rises in the well to any specified height which remains stationary on pumping, the continuous influx of water from the surface in quantity equal to that which could be extracted would not alter the level in the well except perhaps for a short period.

So in those cases of land which requires draining, where there is difficulty with the outlet, the diviner will often be able to discover underground streams which, when pierced with bores or wells, will effectively carry away the surplus water from the surface, and so make the land available to the agriculturist.

When these streams are located and the soil is favourable, they may be tapped with any suitable boring apparatus, such as an ordinary post-hole auger or any such improvised arrangement capable of boring through ordinary earth or clay. Should rock be met with, rock-drilling tools must be used, and the hole should be continued until the diviner is satisfied that the proper stratum has been pierced and that the stream he is after has been reached; the means of knowing this cannot be stated here, but they are known to good diviners and are infallible. When this has been accomplished, case the bore with any suitable casing about 6 in. in diameter; the usual bore casing is too expensive to use for this purpose at present, but galvanised casing may be made and used effectively, or even black iron riveted together. This should be inserted to within a few feet of the bottom of the bore, and brought up to say within 5 ft. of the surface and secured with a flange or by some other means. An excavation about 3 ft. square or round should be made to a depth of 5 ft. and slabbed or bricked in, with a concrete bottom if practicable. All the land drains over several acres can then be conducted to this point, and it will be found that, except during excessive rainfalls, all surplus water will disappear just as the rivers in the Australian interior disappear into the earth. If the underground stream is not too deep—say, about 30 to 40 ft.—a 4 ft. by 3 ft. well, slabbed in the usual way, would be better than a bore, and these can be multiplied to any extent, thus solving what is sometimes a difficult problem.

It must be distinctly understood, however, that this method is not intended to take the drainage from the house or farm buildings, as that would mean the contamination of streams which may be afterwards used for potable water supplies, but this precaution can always easily be taken, so that absolutely no danger can exist.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

No. 14.

Prickly Poppy (*Argemone mexicana*, Linn. var. *ochroleuca* (Sweet), Lindl.).

The Prickly Poppy (*Argemone mexicana* var. *ochroleuca*) has lately been gazetted a noxious weed throughout the State and numerous requests have been received, especially from shire councils, for a description and illustration of the plant. The following account should aid in its identification.

Description.—A robust, herbaceous plant of 2-4 ft. Stems prickly. Leaves glaucous (bluish green) blotched with white, edges spiny-toothed, the midrib and main veins also bearing a few prickles on both the upper and lower surface of the leaf. Flowers very pale yellow or cream coloured. Capsule prickly, opening in valves at the top, full of small, round, brown seeds with a pitted surface.

Distribution.—A native of the West Indies and tropical America; has been introduced into most warm countries and become more or less of a weed. In Queensland it is very widely spread, being found, practically speaking, throughout the whole State, except, perhaps, in a few out-of-the-way places.

Common Names.—In Queensland the plant is most commonly called "Prickly Poppy." In cooler countries, such as parts of Europe and North America, it is cultivated as an ornamental plant under the name of "Mexican Poppy." It is the "Devil's Fig" or "Fico del Inferno" of the West Indies. "Gamboge Thistle" and "Thistle Poppy" are other names applied to it.

Poisonous Properties.—Both in Australia and abroad, the plant has been accused of poisoning stock; in addition to its prickly nature, however, the plant yields a very bitter, yellow juice, and it is not likely that stock would eat the plant to any extent. The seeds are poisonous, and cases are on record in India where a number of people suffered from vomiting and purging after using sweet oil which had been adulterated with Argemone oil ("Agricultural Ledger of India," 1907, p. 37). It belongs to the Poppy family (Papaveraceae) which contains several poisonous plants.

Uses.—The "Agricultural Ledger of India" of 1907, No. 5, deals exhaustively with the uses of this plant. The seeds are oleaginous and the oil has valuable drying properties though not so valuable in this respect as linseed oil; it could be used in paint manufacture and in soapmaking. The oil has been used in India as an external application in skin diseases, it is said, with beneficial results.

Eradication.—In Queensland we only have to do with the plant as a noxious weed. As the plant is a very heavy seeder, seed production should be prevented by hoe-cutting the younger plants, either the leaf-tufts before the flowering stems are formed, or the older plants before the seed has ripened. Spraying with a weed-killing solution should also be successful where the plants are growing thickly together.

Botany.—The variety which is such a bad weed in Queensland is the variety *ochroleuca*, distinguished by its light coloured flowers and a few other characters. The typical form (var. *typica*) is sometimes, though not often seen; it has greener leaves and bright, deep yellow flowers.

Plate 10.—Prickly Poppy (*Argemone mexicana* var. *ochroleuca*).

A Shoot, natural size, showing flowers and unripe capsule.
B Capsule, showing the peristent placentas (*p*) and style (*s*).
C Seed, natural size and enlarged

Entomology.

THE SUGAR-CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Dr. J. F. Illingworth, Entomologist to the Bureau:—

"Fortunately, we are, at last, experiencing ideal growing weather, and, even the weeds are coming on apace. The cane never looked better.

"BEETLE EMERGENCE.

"Really our first good rains did not come, at Meringa, until 19th December, though we had a brief downpour on the 28th of November, that brought out a few beetles.

"Both the greybacks, *Lepidiota albohirta*, and *L. frenchi*, have come out in great abundance this year; this being the time for the regular biennial occurrence for the latter species.

"The extreme abundance of *frenchi* has made it possible for us to add materially to our knowledge of the habits of this species. Since they do not remain on the feeding trees during the day, like the greybacks, there has been less opportunity to study them.

"Upon the approach of darkness, these smaller brown beetles crawl up out of the grass where they have been hiding, and, for about ten minutes, every where about you is one seething hum of the insects. The females settle first upon any low object, bushes, dry twigs, or even upon the fences, and mating at once takes place. Usually, several males cluster about one female, but as soon as one secures connection, he lets himself fall backward, so that he hangs head-downward, and the other males fly away. The pair remains in this position, perfectly motionless, for about twenty minutes, when they separate and fly to their feeding trees, where they remain until morning. Soon after daylight, about half an hour before sunrise, they again become active, leaving the trees in one concerted flight, which lasts for about five minutes, when everything becomes quiet. In place of going straight into the ground, the beetles usually settle upon the stems of any convenient plant, about 18 in. from the surface; here they remain perfectly motionless for several minutes, then proceed slowly downward, into the grass, and finally enter the soil. It is this habit that makes them an easy prey to the 'early-bird.'

"BIRDS A VALUABLE ASSET.

"Soon after the first flight of the beetles this year my attention was attracted by a flock of fowls and ibises under one of the large rubber trees in the Mulgrave Mill yard. They were all actively feeding upon beetles which were dropping out of the tree. Upon closer observation I saw that there were a number of smaller birds in the branches, and these, too, were eating the insects. Usually when one of the birds hopped on a twig and secured a beetle, several others were dislodged and fell to the ground, where they were quickly gobbled.

"I have followed up this interesting line of observation, using my 6X binoculars, with excellent results. Ordinarily, the birds are very timid, in this district, because of a lack of energetic protection; and they scatter before one can get near enough to see what they are eating. By approaching quietly, however, with the glasses, I have been able to observe most of our moderately-sized birds feeding upon the beetles. It may be interesting to note a few of these, such as, the magpie lark, yellow belly, leatherhead, butcher bird, myna, satin bower bird, black bird, laughing jackass, &c. The first two are by far the most numerous, and have the advantage that they follow their prey to the ground if they fail in their first attempt at securing it.

"Most of these birds are too small to swallow the greybacks at one mouthful, but when one is near enough, he can see that they beat the insect to pieces on the larger branches before attempting to down it. Then, too, the quantity eaten by a single bird is limited, but they make up for this in numbers. Just after daylight there is a constant stream of the birds through the feeding trees of the beetles.

"As will be noted above, even the fruit eating birds take kindly to the beetles during this, their nesting season—a fact which agrees with my experience in America, where most of the seed-eating birds feed their young upon insect diet.

"Protection of the bird life of a country is certainly worth considering, for we cannot begin to estimate their value to man, even those that we sometimes class as enemies, when they occasionally eat our corn or kill our chickens. Undoubtedly, birds are the greatest factor in the control of insect pests.

"Theoretically, almost any minute insect with its rapid methods of multiplication, would overrun the earth, making it impossible for man, or other animals to exist, if the offspring of the insect all survived and reproduced.

"This has been forcibly illustrated by T. Bainbrigge Fletcher, in his work on 'Some South Indian Insects,' where he takes the case of an insect laying only 200 eggs and having a life cycle of one month. Starting with 1st January for convenience, a single fertilised female lays 200 eggs, all of which hatch and mature by the end of the month; on the average, half of these will be females, each of which will lay 200 eggs on 1st February, and by the end of February we have $100 \times 200 = 20{,}000$ mature insects, of which half again will be females laying between them $10{,}000 \times 200 = 2{,}000{,}000$ eggs. Continuing, simple calculation shows that by the end of the year the descendants would reach the prodigious total of two septillions (2,000,000,000,000,000,000,000,000,000) of individuals. The human mind is quite incapable of grasping the significance of such a figure, but a few comparisons may assist the imagination. If 1,000 of the insects weighed only 1 oz., their united weight would be 558,035,718,571,425.5 tons, and if 1,000 measured 1 cubic inch, they would cover an area of almost 50,000,000,000,000 square miles with a uniform layer 1 in. deep. Taking the dry surface of the whole earth to be 51,000,000 of square miles, they would cover the whole of this to a depth of over 81 ft.

"Figures such as these are suggestive of what may take place if an insect meets with particularly favourable conditions for development. Probably the most important of these are: (1) favourable climate, (2) abundant food, and (3) freedom from enemies.

"Nature is, usually, nicely balanced, so that no species becomes predominant. Man, however, is often the means of upsetting this balance by transferring insects to new countries, where, removed from their natural enemies, they often become serious pests; or, again, by cutting the forest, he interferes with the nesting of insectivorous birds, &c., with the result that his crops are destroyed until Nature is again able to maintain her balance.

"It is now well recognised that man is able to greatly assist Nature in regaining this equilibrium; and much has been done by the introduction of insect parasites. It is possible, however, to do just as important work by encouraging the birds through protection, &c., so that they will multiply near our homes.

"CULTIVATION EXPERIMENTS.

"I have started an extensive series of cultivation experiments, with proper checks, at the Greenhills Estate, on fields which are regularly destroyed by the grubs. These experiments cover both plant and ratoon crops, and we can hope for some very interesting results within a few months, for the cane is an excellent stand at present.

"Three types of implements are being used, harrow, planet junior, and plough; and I am also trying at different intervals to determine how often it is necessary to stir the ground and disturb the beetles.

"The cane in the Meringa plots is a perfect stand; and, though it was planted in April, it got such a setback by the drought that I am still able to keep the horse going through it. I am hoping for results of this intensive cultivation within the next two or three months.

"NOCTUID MOTH BORER, *PARASTATIPHILA TRUNCATA* WALK.

"Mr. P. H. Edington, at Deeral, has suffered considerably from this pest. The insects have continued for several months on his plant cane; and he told me that he had renewed fully 75 per cent. of the plants in the worst-affected field. At the present time the cane is almost free from attack and as high as one's head, but very uneven, due to the fact that it has been supplied at various times.

"I was not able to locate any of the parasites, though at the time of my visit it was a very difficult matter to even find a caterpillar of the moth in the infested stalks; most of the runs of the borer had been cleared out by the brown ant, *Pleidole megacephala.*"

THE ST. JOHN'S WORT PEST.

PROPOSAL TO UTILISE INSECT ENEMIES FOR ITS ERADICATION.

We have received from the Commonwealth Advisory Council of Science and Industry a report that the Council intended to introduce a beetle to feed on the St. John's Wort, a weed which has become a serious pest in Northern Victoria and threatens to become a pest also in New South Wales and South Australia, which has led to considerable controversy among entomologists and agriculturists in Australia, and strong opposition to the proposal has been expressed by the agricultural authorities in Victoria, supported by experts in South Australia and Western Australia.

The general question of the utilisation of insects as agents for the eradication of weed pests has aroused controversy previously in other parts of the world as well as in Australia, and opposition to proposals of this sort has always been based on the danger that the imported insect might become a more serious pest than the weed that it was introduced to suppress.

That the Advisory Council was fully aware of this aspect of the case is shown by the following extracts from the latest report of the Executive Committee. It is there stated "A weed which threatens to become a very serious pest in the temperate parts of Australia is the St. John's Wort. The Committee came to the conclusion that a possible solution of the problem would be the introduction of some insect which would feed only on St. John's Wort, and they have received from England, through the kindness of Professor E. B. Poulton, F.R.S., of Oxford, and Mr. J. C. F. Fryer, Entomologist to the Department of Agriculture, a list of such insects, prepared by Commander J. J. Walker, R.N. The most promising appears to be the St. John's Wort Beetle, *Chrysomela hyperici*, but further evidence is required as to the damage caused by this beetle to its host plant. According to present information, the liberation of the beetle in Australia would not involve any risk to crops, but this will, of course, require to be proved definitely by properly designed experiments.

The introduction of insects to deal with weeds has already been carried out in Australia on two occasions by the Queensland Department of Agriculture. The lantana fly was brought from Hawaii to combat the lantana, and a cochineal insect from India to destroy a species of prickly-pear. Both these introductions were carried out under the supervision of Mr. Henry Tryon, Government Entomologist and Plant Pathologist of Queensland. As a member of the Queensland Government's Travelling Commission on Prickly Pear, Mr. Tryon visited nearly every country in the world to investigate insect enemies of prickly pear, and at the same time devoted his attention to the general question of utilising insects in combating weed pests. His experience of this question is undoubtedly superior to that of any other entomologist in Australia, and his views on the proposal to introduce an insect to combat St. John's Wort are therefore of great value.

Mr. Tryon writes on this proposal as follows:—

"No entomologist is ignorant of the fact, with respect to insects that feed upon plant life, that of the thousands of different kinds that are known to exist, by far the larger number in each case derive their sustenance, in all stages of their active life, either from one plant-species or from plants constituting a single systematic group; and, moreover, if originally present where it or they were in evidence, perish with their failure and disappearance.

"Also that there are a smaller number (still very many, however) of kinds of insects whose dietary is yielded by more than one plant species, some kinds of insects being with respect to plants decidedly polyphagous.

"But entomologists do not know that there is any certainty, nor, indeed, any high probability, that any insect can or will so change its habits that whilst properly included in one of these categories, it will come to fall within the other.

NOTE.—This proposition is, of course, not affected by the fact that, having regard to food-plant relationship, any one kind of insect may erroneously have been allotted to the former category, when properly it should be regarded as a member of the latter.

"By way of illustration, the case of the lantana and its insect enemies may be mentioned. This weed is attacked by representatives of many species, and some of these (*e.g., Orthezia insignis*) belong to the second category mentioned, *i.e.*, they attack also other plants. Whilst a second series—more numerous—are exclusively lantana feeders. Now, some years ago the Hawaiian authorities, utilising the services and advice of a competent entomologist, introduced to the Sandwich Islands eight of the exclusively lantana feeders, and with this result—they have secured to some extent the benefit they anticipated, whilst in no instance have they found any one

of these eight kinds of insects attacking a plant other than that it was known to victimise. In the case of one of these insects, again, the Hawaiian findings have been confirmed by observations in three other countries.

"An experiment of a like nature has been carried out with reference to prickly-pear and its insect fauna.

"The present writer learnt of the existence of one insect enemy that exclusively fed on a single species of *Opuntia* and actually died out with the disappearance of this kind of prickly pear that it had itself served to destroy. This, with the assistance of a scientific confrère, was rediscovered, taken to South Africa and to Queensland for coping with *Opuntia monacantha*, without impairment of its utility, or manifestation of the additional habit in attacking a second plant-species.

"The question, however, raised by the proposition of the Advisory Council of Science and Industry of the Commonwealth solely relates to insects associated with the injurious weed, 'St. John's Wort,' or species of *Hypericum*. Have we, it may be asked, any ground in the knowledge that is extant regarding them and their habits for concluding that the introduction of the Hypericum associated insects will be fraught with ill effects?

"Now, regarding these insects occurring in Europe only, about one-third are reported as having been met with on plants other than *Hypericum*, one of the plants favoured by one species, in common with an *Hypericum*, being an economic plant, the timber tree, 'the Poplar.' Nineteen different kinds, on the other hand, may be regarded as exclusively feeders on St. John's Wort, no record being available of them having been met with except on plants included in this group.

"It would appear, however, that the Advisory Council of Science and Industry is only so far proceeding with the making of arrangements for the introduction to Victoria of the St. John's Wort Beetle (*Chrysomela hyperici*), which has been recommended by Professor E. B. Poulton, F.R.S., Oxford, and Mr. J. C. F. Fryer, Entomologist to the English Board of Agriculture, as being most likely to prove suitable for the purpose of eradicating St. John's Wort.

"Now, this beetle has been found occurring over a wide area in Europe, under many different circumstances of plant association, and, although it has been referred to by many entomologists who have recorded observations concerning it from time to time since its identification, by Forster on the one part and Fabricius on the other, upwards of 150 years since, it has never been spoken of otherwise than as exclusively associated with St. John's Wort.

"The same remarks, so far as relates to plant relationship, may be also affirmed regarding three other species of Hypericum-loving *Chrysomela*, although Panzer has mentioned one of them, viz., *Chrysomela varians* of Fabricius also, as having been met with, too, on Mentha and Centaurea, a statement now regarded as due to erroneous identification.

"The correspondence suggests that the importation of *Chrysomela hyperici*, Forster, is likely to jeopardise the agricultural interests of Victoria. The present writer would submit that so far as the continued occurrence of the notorious weed in question affects these interests, they would be more likely to be jeopardised by refraining from introducing insects such as the one named in Professor Poulton's proposal, and whose presence and increase, if naturalised here, would be calculated to control its development, if not to actually exterminate it, and it is therefore fortunate that it has deemed fit to consult an entomologist of his eminence with the result of having elicited it."

(Sgd.) HENRY TRYON.

RECORD FOR WHEATEN CHAFF.

It is not so very long ago that wheaten hay chaff was almost an unknown commodity, and it is only of late that its true value as a feed has come to be recognised. It now ranks next to oaten chaff, and by many a mixture of oaten and wheaten chaffs is considered much better than pure oaten for both cattle and horses, provided, of course, that there is not too much whole grain in the chaff. The shortage of maize has also fostered a new industry, and trade in bruised wheat has become a regular thing, and seems to have come to stay. At a sale early in February last at the Roma-street produce markets a record for the market was put up for wheaten hay chaff, very choice lines selling at 11s. 3d. and 11s. 3d. per cwt, other lines changing hands at 10s. 9d. and 11s.

General Notes.

SOCIETIES' SHOW DATES, ETC., 1919.

NAMBOUR.—The Maroochy Pastoral, Agricultural, Horticultural, and Industrial Society, 10th and 11th July.

GAYNDAH.—The Gayndah Pastoral, Agricultural, Industrial, and Horticultural Association, 1st, 2nd, and 3rd July.

MOUNT GRAVATT.—The Mount Gravatt Agricultural, Horticultural, and Industrial Society, 26th July.

INKERMAN.—Mr. E. F. Ryan has been appointed Secretary of the Inkerman Farmers' and Progress Association.

The title of The Caves Central Barmoyea Farmers' Progress Association has been altered to The Caves Farmers' Progress Association. Thos Ritchie, Secretary.

Answers to Correspondents.

APPLICATION OF MEATWORKS FERTILISER TO POTATOES.

In response to the inquiry made by Mr. H. R. Trueman, Mr. A. E. Gibson, Agricultural Instructor, has furnished the following information:—

"The best method of application is to broadcast the fertiliser over the ploughed land, which should then be disced deeply, and the land should be subsequently ploughed to the full depth prior to planting. By so doing more even distribution of manure is obtained and the roots are encouraged to descend and spread out.

"A system of opening drills and spreading the fertiliser along the bottom, following with a stroke of the harrows in the same direction as the furrows, prior to planting, is very often followed, but the same even distribution of fertiliser throughout the soil is not obtained.

"Meatworks manure used alone without some form of potash, such as muriate or sulphate, has a tendency to produce tops."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1919.

Article		FEBRUARY.
		Prices.
Bacon	lb.	1s. to 1s. 1d.
Barley	bush.	5s. to 5s. 3d.
Bran	ton	£7 5s.
Broom Millet	„	£50 to £85
Broom Millet (Sydney price)	„	£75
Butter (First Grade) 56 lb. boxes	cwt.	172s. 8d.
Butter (First Grade) 28 lb. boxes	„	175s.
Chaff, Mixed	ton	£11 to £13 10s.
Chaff, Oaten	„	£11 to £11 5s.
Chaff, Lucerne	„	£14 to £15 10s.
Chaff, Wheaten	„	£10 15s. to £12 5s.
Cheese	lb.	11d. to 1s. 4½d.
Flour	ton	£12
Hams	lb.	1s. 4½d.
Hay, Oaten	ton	£8 5s. to £9 15s.
Hay, Lucerne	„	£12 to £14
Hay, Wheaten	„	...
Honey	lb.	2d. to 5d.
Maize	bush.	7s. 5d. to 7s. 10d.
Oats	„	5s. 3d.
Onions	ton	£18 to £22
Peanuts	lb.	4d. to 6d.
Pollard	ton	£8 5s.
Potatoes	„	£20 5s. to £25
Potatoes (Sweet)	cwt.	5s. to 8s.
Pumpkins (Cattle)	ton	£15 to £24
Wheat	bush.	5s. 9d.
Eggs	doz.	1s. 6d. to 2s. 6d.
Fowls	per pair	2s. 6d. to 4s. 2d.
Ducks, English	„	4s. 6d. to 5s. 6d.
Ducks, Muscovy	„	3s. 9d. to 7s.
Geese	„	7s. to 8s. 3d.
Turkeys (Hens)	„	10s. 3d. to 12s. 6d.
Turkeys (Gobblers)	„	15s. to 22s.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	6s. to 15s.
Beetroot, per dozen bundles	1s. 3d. to 1s. 6d.
Cabbages, per dozen	10s. to 16s. 6d.
Carrots, per dozen bunches	1s. to 1s. 9d.
Cucumbers, per dozen	2s. 6d. to 4s.
Lettuce, per dozen	...
Marrows, per dozen	3s. 6d. to 10s.
Parsnips, per dozen bunches	1s. 3d. to 2s.
Peas, per sugar-bag	5s. to 8s.
Sweet Potatoes, per sugar-bag	5s.
Pumpkins (table), per cwt.	12s. 6d. to 25s.
Tomatoes, per quarter-case	5s. 6d. to 13s.
Turnips, per dozen bunches	6d. to 1s.

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Queensland), per case	10s. to 17s.
Bananas (Tweed River), per case	10s. to 17s.
Bananas (Fiji), per bunch	...
Bananas (G.M.), per bunch	...
Bananas (G.M.), per case	...
Cucumbers, per double case	...
Lemons (local), per bushel-case	12s. to 18s.
Mandarins, per bushel-case	...
Oranges (Navel), per case	...
Oranges (Local), per case	20s. to 22s.
Oranges (Queensland), per case	...
Pears, per case	4s. to 7s.
Passion Fruit (Queensland), per case	...
Pineapples (Queens), per case	7s. to 8s. 6d.
Pineapples (Ripleys), per case	9s. to 11s.
Pineapples (Common), per case	8s. to 10s.
Strawberries, per box	5d. to 8d.
Tomatoes, per half-case	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, Eating, per bushel-case	13s. to 15s.
Apples, Cooking, per bushel-case	5s. to 9s.
Bananas (Cavendish), per dozen	2½d. to 6½d.
Bananas (Sugar), per dozen	3d. to 6d.
Cherries, per box	...
Citrons, per hundredweight	...
Cocoanuts, per sack	15s. to 25s.
Figs, per dozen boxes	7s. to 8s.
Custard Apples, per quarter-case	...
Grapes, black, per lb.	4d. to 8d.
Grapes, white, per lb.	4½d. to 6½d.
Lemons (Lisbon), per case	12s. to 14s.
Mandarins, per case	...
Mangoes (market glutted), per case for special	1s. 6d. to 4s.
Nectarines, per case	8s. to 10s.
Oranges (Navel), per case	...
Oranges (Seville), per hundredweight	...
Oranges (Other), per case	...
Papaw Apples, per quarter-case	2s. 6d. to 5s. 6d.
Passion Fruit, per quarter-case	4s. 6d. to 10s. 6d.
Peaches, per quarter-case	5s. to 9s.
Peanuts, per lb.	4d. to. 6d.
Persimmons (market glutted), per quarter-case	1s. to 2s. 6d.
Pineapples (Ripley), per dozen	1s. to 3s.
Pineapples (Rough), per dozen	1s. to 3s.
Pineapples (Smooth), per dozen	1s. to 3s.
Plums, per case	4s. to 8s. 6d.
Rockmelons, per dozen	4s. to 12s.
Sugar-melons, per dozen	5s. to 15s.
Strawberries, per dozen boxes	...

TOP PRICES, ENOGGERA YARDS, JANUARY, 1919.

Animal.	JANUARY. Prices.
Bullocks	£20 12s. 6d. to £28
Cows	£15 5s. to £20 5s.
Merino Wethers	47s. 3d.
Crossbred Wethers	44s. 6d.
Merino Ewes	40s. 6d.
Crossbred Ewes	36s.
Lambs	30s.
Pigs (Bacon)	...
Pigs (Porkers)	58s.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Jan.	Average Rainfall. No. of Years' Records.	Total Rainfall. Jan., 1919.	Total Rainfall. Jan., 1918.
North Coast.	In.		In.	In.
Atherton	12·69	17	4·10	15·94
Cairns	17·26	36	8·62	13·73
Cardwell	17·14	46	8·58	25·07
Cooktown	15·16	42	9·10	8·53
Herberton	9·77	31	6·27	14·81
Ingham	16·78	26	9·20	27·25
Innisfail	21·53	37	12·54	16·48
Mossman	20·33	10	10·09	17·08
Townsville	11·69	47	6·09	27·75
Central Coast.				
Ayr	11·83	31	6·68	31·13
Bowen	9·61	47	9·70	46·57
Charters Towers	5·69	36	1·16	12·07
Mackay	13·83	47	10·24	85·09
Proserpine	16·09	15	13·79	58·90
St. Lawrence	9·08	47	1·71	49·44
South Coast.				
Biggenden	5·43	...	0·58	9·32
Bundaberg	9·20	35	0·16	1·90
Brisbane	6·42	68	0·32	7·70
Childers	7·94	23	0·21	13·89
Crohamhurst	13·02	25	0·43	20·20
Esk	5·51	31	2·21	7·62
Gayndah	4·79	47	0·73	9·83
Gympie	6·64	48	0·44	11·17
Glasshouse M'tains	8·65	10	0·09	16·64
Kilkivan	5·62	39	0·76	13·06
Maryborough	7·31	47	0·49	14·07
South Coast—continued:				
Nambour	9·01	22	1·12	15·14
Nanango	4·55	36	0·18	7·79
Rockhampton	8·65	31	0·34	34·36
Woodford	7·13	31	0·20	15·79
Darling Downs.				
Dalby	3·29	48	0·71	5·13
Emu Vale	3·28	...	0·89	4·17
Jimbour	3·82	...	0·67	5·09
Miles	3·96	33	1·03	4·74
Stanthorpe	3·69	45	0·18	3·72
Toowoomba	5·04	46	0·48	6·15
Warwick	3·71	31	0·23	3·17
Maranoa.				
Roma	3·39	44	1·74	8·93
State Farms, &c.				
Bungeworgorai	1·08	...	0·49	8·76
Gatton College	4·32	...	1·13	7·36
Gindie	3·29	..	Nil	21·95
Hermitage	2·92	...	0·15	3·79
Kairi	7·29	4	4·76	18·30
Sugar Experiment Station, Mackay	14·0	...	10·29	78·17
Warren	2·08	4	0·44	34·31

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systematic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry planting may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and, when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will be ready for a first or second hilling up. The last of the maize will have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots. Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high, go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, pentstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·41	6·20	5·58	5·47
2	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
3	4·59	6·46	5·23	6·41	5·42	6 18	5·59	5·44
4	5·0	6·46	5·24	6·41	5·43	6·17	6·0	5·43
5	5·0	6·46	5·24	6·40	5·44	6·16	6·0	5·42
6	5·1	6·47	5·25	6·39	5·44	6·15	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·12	6·2	5·38
10	5·3	6·47	5·28	6·36	5·46	6·11	6·3	5·37
11	5·4	6·47	5·29	6·36	5·47	6·10	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·9	6·4	5·35
13	5·6	6·47	5·31	6·35	5·48	6·8	6·4	5·35
14	5·6	6·47	5·31	6·34	5·49	6·7	6·4	5·34
15	5·7	6·47	5·32	6·33	5·49	6·6	6·5	5·33
16	5·8	6·47	5·33	6·32	5·50	6·5	6·5	5·32
17	5·9	6·47	5·33	6·31	5·50	6·4	6·6	5·31
18	5·10	6·47	5·34	6·30	5·51	6·3	6·6	5·30
19	5·10	6·47	5·35	6·29	5·51	6·2	6·7	5·29
20	5·11	6·47	5·35	6·28	5·52	6·1	6·7	5·28
21	5·12	6·46	5·36	6·28	5·52	6·0	6·8	5·27
22	5·13	6·46	5·36	6·27	5·53	5·59	6·8	5·26
23	5·14	6·46	5·37	6·26	5·53	5·58	6·9	5·25
24	5·15	6·45	5·38	6·25	5·54	5·57	6·9	5·24
25	5·16	6·45	5·38	6·24	5·54	5·56	6·10	5·23
26	5·16	6·45	5·39	6·23	5·55	5·55	6·10	5·22
27	5·17	6·44	5·40	6·22	5·56	5·53	6·11	5·21
28	5·18	6·44	5·41	6·21	5·56	5·52	6·11	5·20
29	5·19	6·43	...	...	5·57	5·50	6·12	5·19
30	5·20	6·43	...	...	5·57	5·49	6·12	5·18
31	5·21	6·42	...	...	5·58	5·48	...	...

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

			H.	M.
2 Jan.	●	New Moon	6	24 p.m.
9 „	☾	First Quarter	8	55 p.m.
16 „	○	Full Moon	6	45 p.m.
24 „	☽	Last Quarter	2	22 p.m.

The Moon will be nearest the earth on the 11th about 8 p.m., and farthest from the earth on 24th about 9 a.m.

1 Feb.	●	New Moon	9	7 a.m.
8 „	☾	First Quarter	4	52 a.m.
15 „	○	Full Moon	9	38 a.m.
23 „	☽	Last Quarter	11	48 a.m.

The Moon will be nearest the earth on 5th about midday, and farthest away on the 21st about 6 a.m.

2 Mar.	●	New Moon	9	12 p.m.
9 „	☾	First Quarter	1	14 p.m.
17 „	○	Full Moon	1	41 a.m.
25 „	☽	Last Quarter	6	34 a.m.

The Moon will be nearest the earth on the 4th about midnight, and farthest away on the 20th about 11p.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun will rise and set about 4 minutes later than at Brisbane, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.